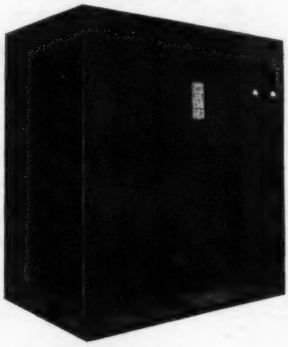
The Monthly Review

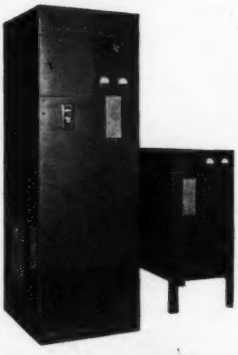
Published by the AMERICAN ELECTROPLATERS' SOCIETY

FEBRUARY 1939

Engin. brary E M Baker

Complete—Simple—Compact





The Copper Oxide Plate Type Rectifier is rapidly gaining acceptance for all requirements where Direct Current of not more than 6 volts is to be converted from an Alternating Current source. Here is a single unit of cabinet type, furnished in various sizes, easily installed, eliminating all moving parts except a small fan—yet maintaining high power factor, efficiency and long life.

The illustration at the top shows a 3000 ampere—6 volt unit, the two in the center are respectively 500 ampere—6 volt and 375 ampere—6 volt, while the bottom view illustrates the simplicity of internal construction of the 3000 ampere size unit.

Write for our special Bulletin giving complete details on this modern cabinet type Direct Current unit.

HANSON-VAN WINKLE-MUNNING CO. MATAWAN, NEW JERSEY U.S.A. SINCE 1920

Manufacturers of a complete line of electroplating and polishing equipment and supplies

HANSON-VAN WINKLE-MUNNING CO.

MATAWAN, NEW JERSEY

PLANTS Matawan, New Jersey . . Anderson, Indiana . . Bridgeport, Connecticut

SALES OFFICES · Chicago · Cleveland · Detroit · New Haven · New York · Philadelphia · Pittsburgh · Springfield (Mass.) · Syracuse

US EQUIPMENT

SINCE 1896

For Plating, Metal Cleaning, Pickling, Acid Dipping, Drying and Allied Applications.

FULLY AUTOMATIC **SEMI AUTOMATIC**

MANUALLY OPERATED
For every requirement

PLATING BARREL APPARATUS
For all finishes

STILL TANK EQUIPMENT
For general plating

VARIABLE SPEED PLATING APPARATUS
For all kinds of plating

CONTINUOUS PLATING UNITS
Any combination of operations for cleaning, plating, rinsing and drying

MECHANICAL CLEANING APPARATUS
Any series of operations

AUTOMATIC ACID TREATMENT UNITS
Any combination of operations

DRYERS
Rotary Drum, Conveyor and Table Types

GENERATOR EQUIPMENT
Generators — Motor-Generator Sets

SOLUTIONS
Plating, cleaning, acid treatment, etc.

U. S. GALVANIZING & PLATING EQUIPMENT CORPORATION

Incorporated 1896

30 Heyward Street Brooklyn, N. Y.

The Monthly Review

Published by the AMERICAN ELECTROPLATERS' SOCIETY, Inc.

A Society for the Advancement of the Science of Electroplating

FEBRUARY 1939

Editorial 89

Kasper **— Current Distribution in Electrodeposition** 91

International Convention 110

Stocker **— Bright Nickel Plating** 111

Weisberg **— Purifying of Bright Nickel Solutions** 122

Branch News 124

Here and There 144

Membership Report 154

Abstract Section 156

Branch Directory 165

Buyers' Guide 166

SUBSCRIPTION $3.00 A YEAR

Entered as second class matter at the Post Office at Springfield, Mass., September 8, 1930, under Act of August 24, 1912.

Acceptance for mailing at special rate of postage, provided for in section 1103, Act of February 28, 1925, authorized September 3, 1926.

Today's Demands for Efficiency and Economy Are Being Met with . . .

MEAKER

PLATING EQUIPMENT

●

★**MEAKER FULL AUTOMATICS**

Plating and
Processing
Machines
of All Types

★**MEAKER VARIABLE SPEED PLATING MACHINES**

★**MEAKER-ELECTRIC PRODUCTS GENERATORS**

Every piece of Meaker equipment is backed by over 38 years of hard-pan operating experience and practical engineering accomplishment.

●

THE MEAKER COMPANY

1629-41 S. 55th Avenue (Cicero Station), Chicago, Ill.

The MONTHLY REVIEW

Published by the
AMERICAN ELECTROPLATERS' SOCIETY, INC.

Publication and Editorial Office
90 Maynard St.
Springfield, Massachusetts

VOL. XXVI FEBRUARY 1939 NO. 2

Editorial

Looking back over the months that have elapsed since the Milwaukee Convention, we are pleased to note the steady increase in our membership. Thanks to the co-operation of the Branches under the leadership of 1st Vice-President R. M. Goodsell, chairman of the Membership Committee, we are steadily progressing, so that we now have a total enrollment of almost two thousand members.

Some of our enthusiasts told us, after the annual meeting, that because of the changes adopted in the Constitution and By-Laws, we would double our membership inside the year. This forecast has not proved correct, the reason being that most of our branches have sought out men who are fully qualified to meet the present membership requirements, rather than presenting names of men who are not so qualified and are therefore undesirable. This is as it should be, and proves once again that the Branch officers, in keeping the recent amendments in mind, are more anxious to build the Society up with quality rather than with those whose eligibility could be questioned as members of the A.E.S.

In other issues of the REVIEW we have mentioned several men who have been outstanding in boosting their Branch membership. We would call our readers attention also to the splendid work being done in this connection by Carl Heussner and the membership committee of Detroit Branch. Every month since the campaign started, Mr. Heussner's committee has shown the fruits of their labors. Closing the fiscal year 1937-38 with a total membership of 144, Detroit Branch now has 195 members enrolled. This splendid record of achievement should stimulate all other Branches to hustle between now and the Convention in June in order to swell their Branch membership by every legitimate means.

There are still hundreds of platers who need the A.E.S. that are not being contacted. These men should by all means be given an invitation to come in and receive the educational benefits so badly needed to help solve the difficult problems presented from day to day in the electroplating business.

NEW ENGLAND REGIONAL MEETING

In an endeavor to bring together all the members and friends, their wives and families of the New England Branches, particularly Bridgeport, Hartford, New Haven, Springfield and Waterbury, it has been decided to have an Educational Session and Banquet at the Hotel Garde, Hartford, on Saturday, April 15. To this end the following committees have been appointed:

Plans are nicely under way to make this the best meeting ever held in New England. Although no advertising will be solicited, the program will be full of Educational, Social and entertaining features that will make this an event you can't afford to miss.

Our friends from Boston and Providence, who are holding their own annual this year on March 4 have promised to be with us. Invitations are extended to all other branches. An event such as this in the heart of the plating industry should have the hearty support of the platers, supply houses and every line of industry in which plating is being done. Watch the REVIEW and trade journals for full details. We want everyone engaged in any phase of the industry to come.

The success of the meeting is in the members' hands. The committee is counting on you. Remember the date and place,—Saturday, April 13, at the Garde in Hartford.

NEW ENGLAND REGIONAL BRANCHES ANNUAL EDUCATIONAL MEETING AND BANQUET

April 15, 1939

COMMITTEE MEMBERS

General Chairman—W. E. Bancroft, Hartford Branch, Pratt & Whitney, Hartford, Conn.

Educational Committee—Ch. Ray O'Connor, Bridgeport Branch, Contract Plating Co. Stratford, Conn.; Joseph Downes, New Haven Branch, Remington-Rand Co., Middletown, Conn.; Joseph Sullivan, New Haven Branch, New Haven Clock Co.,

Publicity Committee—Ch. John Costigan, Springfield Branch, Hampden Chemical & Color Co., 171 Armory St., Springfield, Mass.; D. S. Hartshorn, Jr., Springfield Branch, 76 Edendale St., Springfield, Mass.

Treasurer and Ticket Committee—Ch. E. T. Candee, Waterbury Branch, American Metal Hose Branch, American Brass Co., Waterbury, Conn.

Hotel and Entertainment Committee—Ch. Vernon Grant, Hartford Branch, 18 Birge Rd., Bristol, Conn.; Joseph Pietro, Hartford Branch, Horton Mfg. Co., Bristol, Conn.; Apley N. Austin, Hartford Branch, Pequabuc, Conn.; Arthur Logozzo, Hartford Branch, Pratt & Whitney, Hartford, Conn.

Advisory Committee—Ch. Walter Meyers, Bridgeport Branch, *Metal Industry*, 116 John St., New York; W. J. R. Kennedy, Springfield Branch, 90 Maynard St., Springfield, Mass.; L. Lougee, Waterbury Branch, 182 West Main St., Waterbury, Conn.

Current Distribution *in* Electrodeposition

II. Point-Plane and Line-Plane Systems

By CHARLES KASPER[1]

Second of a Series of Articles by Dr. Kasper on Current Distribution

I. INTRODUCTION

IN paper I[2] of this series, we considered linear, cylindrical and spherical conductors. Although the current densities over the electrodes were uniform, the conductors differed fundamentally in that in the first case the electrical flow could be said to be in one direction (one-dimensional); in the second, in two directions (two-dimensional); and in the third, in three directions (three-dimensional). One-dimensional flow is represented only by the rather trivial case of linear conductors, while the number of cases that represent two- and three-dimensional flow is indefinite and includes most of those of concern to the electroplater.

The foregoing distinction in dimensionality is important. Strictly speaking, all conduction is spatial (three-dimensional); but certain geometrical conditions may simplify the considerations. In linear conductors the specification of one direction is sufficient. In three-dimensional flow, if the conditions are identical in one direction, as, for example, in the direction of the axes of concentric cylinders, the problem may be simplified by considering the flow as two-dimensional. In such a case the sameness, or, more appropriately expressed, the invariance, of the flow in one direction must be borne in mind.

In this paper, we shall consider only one specific case of three-dimensional flow, that is, from a point electrode to an infinite plane electrode. A number of cases of two-dimensional flow will be considered, which are illustrated in Fig. 1. It is quite evident from the nature of these problems that we are leading up to the consideration of the current flow in finite systems when the current density is not uniform over the electrodes. The problem of inclosing completely a line electrode in a rectangular box, i.e.,

[1] Chemist, National Bureau of Standards.
[2] Proceedings of the Twenty-Sixth Annual Convention of the American Electroplaters' Society, pages 21-32, 1938; and THE MONTHLY REVIEW, January, 1939

inserting the omitted walls in cases E, F, H, and I of Fig. 1, can be readily solved, and likewise the problem when the wall is circular, with the conducting side a complete circle, a chord, or an arc. Some of these problems will be considered in later papers. The particular aim of the group of problems presented in this paper is to illustrate some of the effects of walls on current distribution.

II. THE POINT-PLANE PROBLEM

The point-plane problem (three-dimensional flow) is related to the problem of flow between concentric spheres. If the external sphere is so large that we may call it a great sphere, the po-

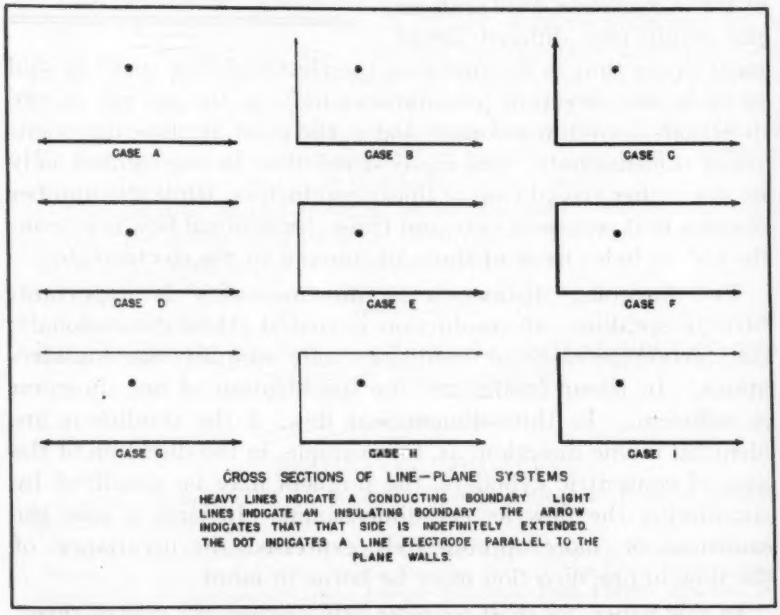

CASE A
CASE B
CASE C
CASE D
CASE E
CASE F
CASE G
CASE H
CASE I
CROSS SECTIONS OF LINE—PLANE SYSTEMS
HEAVY LINES INDICATE A CONDUCTING BOUNDARY LIGHT LINES INDICATE AN INSULATING BOUNDARY THE ARROW INDICATES THAT THAT SIDE IS INDEFINITELY EXTENDED. THE DOT INDICATES A LINE ELECTRODE PARALLEL TO THE PLANE WALLS.

Fig. 1—Typical line-plane systems.

tential at the surface of the internal sphere, or on any equipotential surface, will be inversely proportional to the distance from the center of the internal sphere, i.e.,

$$V = \frac{I}{4\pi K} \frac{1}{r},$$

where r is the distance, I is the total current, and K is the specific conductivity. That the relationship must be true can be readily seen from the consideration given to that problem in paper I.

This relation will also be true if the internal electrode is shrunk to a point, provided the current is kept constant. With respect to flow, the problem is identical (except for direction and sign), whether the internal electrode is positive or negative.

We will now employ the principle of superposition—one of the cardinal principles of the theory of the potential[3]. If we consider a positive point electrode and a negative point electrode of the same current strength, separated by a distance 2a, the

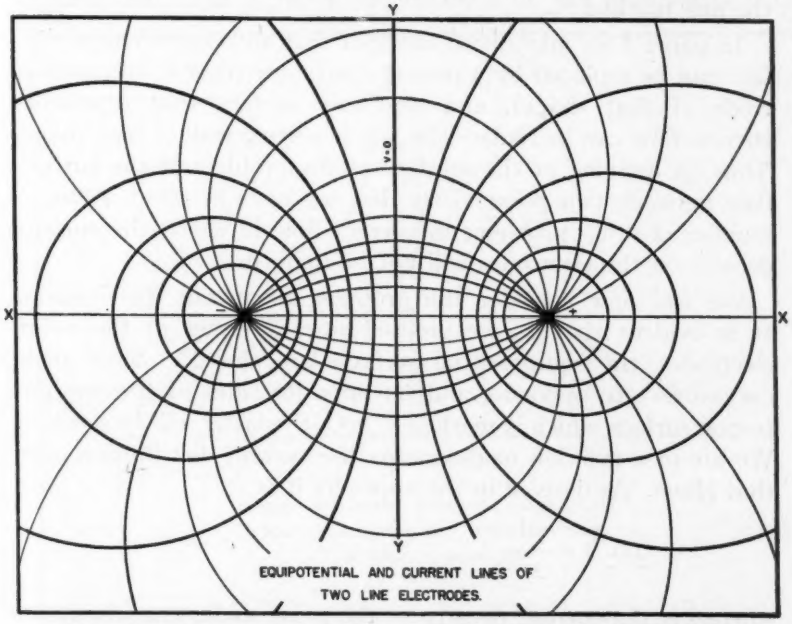


Fig. 2—The black spots are sections of two line electrodes. The light lines represent the lines of current flow. The dark lines are equipotential surfaces.

result will be that no current flows to or from the great sphere, that is, all of the current will flow from the positive to the negative electrode. By the principle of superposition the potential at any point in the medium will be the algebraic sum of the potentials, i.e.,

$$(1)\quad V = V_+ + V_- = \frac{I}{4\pi K}\cdot\frac{1}{r_1} - \frac{I}{4\pi K}\cdot\frac{1}{r_2} = \frac{I}{4\pi K}\left(\frac{1}{r_1} - \frac{1}{r_2}\right),$$

where r_1 and r_2 are the respective distances of the point in

[3]The principle of superposition is an aspect of the more general physical law of the algebraic addition of scalar quantities. Through the shrinkage of the internal electrodes to points, whose positions are fixed, the problem of interaction is eliminated.

question from the positive and negative electrodes. From this equation the equipotential surfaces can be drawn, and also, as we have already seen, the current lines. (As has been emphasized, these two types of surfaces will always cross normally.) Their exact drawing is rather difficult but they will be very similar to those represented in Fig. 2, (which are drawn for line electrodes). In order to portray the situation in three dimensions, it is necessary to rotate a diagram similar to Fig. 2 about the axis marked X.

In paper I we introduced the idea that any equipotential surface can be replaced by a perfect conductor (that is, by an electrode of that shape), and that any surface that represents current flow can be replaced by an insulating wall of that shape. Thus, in arriving at the solution of the problem of the current flow between two point electrodes, we have in effect solved a number of other problems in current flow in which the current density on the electrodes will not be uniform.

We will now consider the problem of current distribution. It is evident that as we proceed toward either of the point electrodes, the equipotential surfaces are closed[4]. Since their curvatures are opposite, and on opposite sides of the equipotential surface which is marked V = O, the latter will be a plane. We are in a position to determine the current distribution over that plane. As derived in the appendix it is

$$(2) \quad i = \frac{-aI}{2\pi r^3},$$

where i is the current density at the point under consideration, a is the shortest distance of the point electrode from the plane, I is the total current, and r is the distance from the point electrode to the point under consideration on the plane. A section of this distribution for a particular case is shown in Fig. 3. (As only relative current densities are involved, no numerical values of current density are assigned. The units refer only to distances from and along the plane electrode.) To see how the current distributes itself over the plane electrode, it is necessary to rotate the figure about the axis marked i.

[4]They are not spheres, as is readily confirmed from the expression for the potential function in the appendix. The solution of the problem of two exterior spheres requires an indefinite number of images. The problem of eccentric spheres is more recent. For an excellent treatise on the problem of two spheres see Geiger-Scheel's "Handbuch der Physik".

From the nature of the current lines shown in Fig. 2, it is evident that an insulating wall in back of the point electrode would affect markedly the current distribution over the plane. This particular problem was solved in 1855 by G. F. B. Riemann[5], one of the greatest of mathematicians. It is of interest that this work was done in order to furnish the experimentalists of his generation with a convenient model for the study of current distribution in electrolytic systems. Foremost of these was Beetz, noted particularly for his work on the establishment of

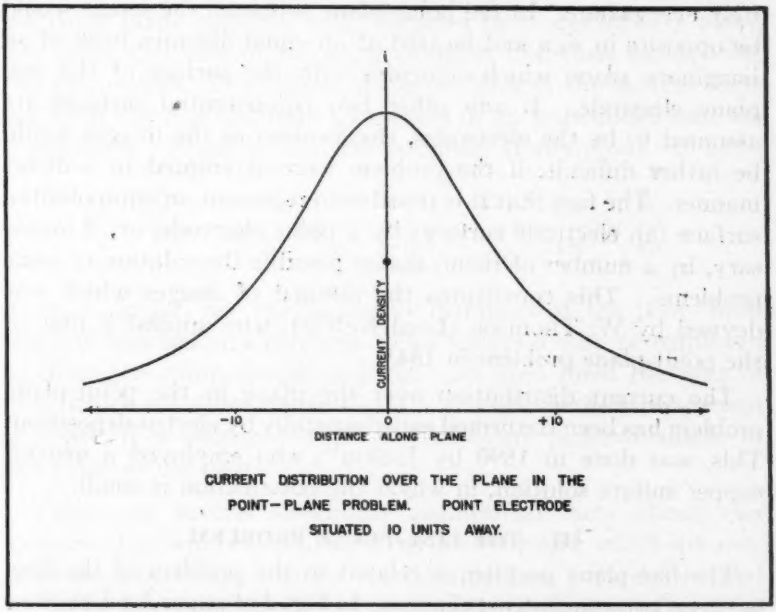


Fig. 3—Diagram showing that the current from a point to a plane varies inversely as the cube of the distance.

Faraday's laws of electrolysis. Of course, in the development of the subject to its modern status, better models have been and can yet be worked out. It is one of the purposes of this series of papers to bring this to attention. For example, the inclined cathode of Busse[6] and Mantzell[7], and the bent cathode of Sizelove[8] and of Pinner and Baker[9], two of the "objects" that

5Riemann-Weber, Vol. II, p. 336. Die Differential Gleichungen der Physik. 7th Edition, 1937. Vieweg und Sohn.
6O. Busse, Zeit. für Elektrochemie, **38**, 789, (1932).
7E. Mantzell, Zeit. für Elektrochemie **42**, 303, (1936); also ibid. **43**, 174 (1937).
8O. J. Sizelove, MONTHLY REVIEW of the American Electroplaters' Society, April, 1929.
9W. L. Pinner and E. M. Baker, Trans. Amer. Electrochem. Soc. **55**, 315, (1929).

have been studied extensively with respect to current distribution in electrodeposition, were solved by H. F. Moulton[10] in 1905. In view of such developments, Riemann's problem has lost its importance, and, as the method he employed is not elementary, we will not consider it.

In solving the problem of the point-to-the-plane, it would have been simpler to assume tacitly the existence of the great sphere at zero potential, and to consider an *image* of the point electrode with the conducting medium (the electrolyte) extended indefinitely everywhere. In the point-plane problem, the image would be opposite in sign and located at an equal distance back of an imaginary plane which coincides with the surface of the real plane electrode. If any other two equipotential surfaces are assumed to be the electrodes, the location of the images would be rather difficult, if the problem were attempted in a direct manner. The fact that it is possible to represent an equipotential surface (an electrode surface) by a point electrode, or, if necessary, by a number of them, makes possible the solution of some problems. This constitutes the method of images which was devised by W. Thomson (Lord Kelvin), who applied it first to the point-plane problem in 1845.

The current distribution over the plane in the point-plane problem has been confirmed experimentally by electro-deposition. This was done in 1890 by Joubin[11], who employed a neutral copper sulfate solution, in which the polarization is small.

III. THE LINE-PLANE PROBLEM

The line-plane problem is related to the problem of the flow between two concentric cylinders. In Fig. 3 of paper I, we showed that the potential varies in a logarithmic manner, a relation that is characteristic of all two-dimensional systems. They are much simpler than the three-dimensional cases, which is recognized in the theory of the potential by classifying them under a separate head, called the logarithmic potential.

The potential at any point between the two cylinders is $V = \frac{I}{2\pi K} \log \frac{R}{r_1}$, where R is the radius of the large cylinder and r_1 is the distance from the center of the two cylinders. This re-

[10] H. F. Moulton, Proc. London Math. Soc, Series **2**, 3, p. 104, 1905.
[11] P. Joubin. Compt. rendus, vol. **110** p. 37 (1890).

lationship is independent of the size of the internal cylinder, provided the same current flows. We may therefore consider the internal cylinder to be a line. Since the principal drop of potential occurs in the neighborhood of the internal electrode, the above relation will still be true, if the external cylinder is very large, even though the line electrode is displaced by a distance a from the center. In this particular operation, the internal electrode is made positive, in order to be consistent with the form for the potential. By repeating the same operation with the internal electrode made negative and displaced by a distance $-a$ along the same diameter of the great cylinder, and then superposing the two results, the solution of the problem of the current flowing from one line electrode to another in an unbounded medium is obtained. Algebraically, the potential at any point will be:

$$(3)\quad V = V_+ + V_- = \frac{I}{2\pi K}\log\frac{R}{r_1} - \frac{I}{2\pi K}\log\frac{R}{r_2} = \frac{I}{2\pi K}\log\frac{r_2}{r_1},$$

where r_1 and r_2 are the respective distances of the point from the first and second electrodes. This equation may be employed to draw the equipotential surfaces, and from them the lines of flow, which are illustrated in Fig. 2. To portray the arrangement in space, it is necessary to move this figure perpendicularly to the plane of the page.

There are several important geometrical facts about this system. The equipotential surfaces are cylinders, which are not, however, concentric. Since the lines of flow must be normal to them they may also be represented by cylinders. Since the distance a is arbitrary, we can solve from the argument presented any problem involving cylinders of any size, whether eccentric or outside of each other. The problem as presented here was solved by W. Thomson, and various aspects of it have been worked out by many mathematicians since that time. Even at the present time there are many new types that can be solved with better methods of attack.

The particular problem here is that of a line to a plane. It is quite evident that, since the curvature of the equipotential surfaces around each line electrode is opposite in sign, an equipotential surface of zero curvature, that is, a plane, exists mid-

way between them. The current distribution over that plane as derived in the appendix is

$$(4)\quad i = \frac{-aI}{\pi r^2},$$

where the symbols have the meanings already assigned. The current density at any point on the plane varies inversely as the square of the distance from the line electrode. This is illustrated for a special curve in Fig. 4. To portray it in space, it

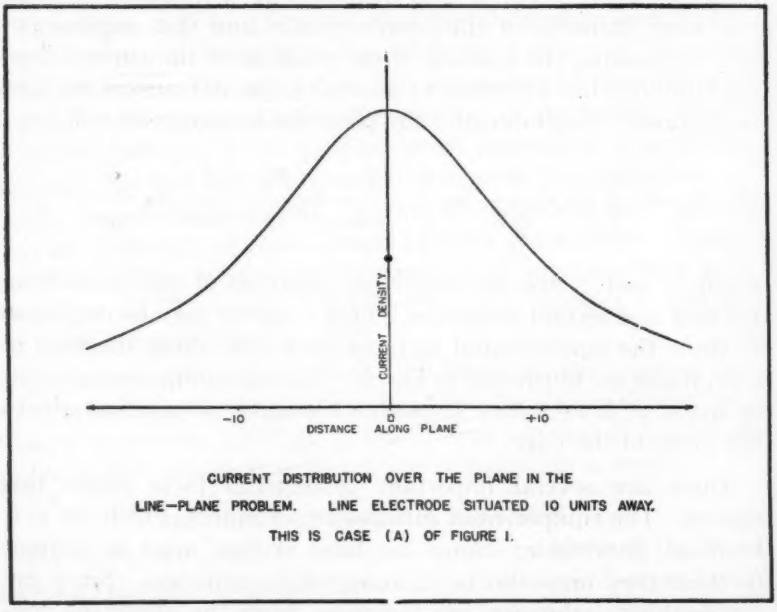


Fig. 4—Diagram illustrating the current from a line to a plane, which varies inversely as the square of the distance.

is necessary to move the figure perpendicularly to the paper. This corresponds to case A of Fig. 1.

We see that the method of images can be applied to the two-dimensional cases. The image problems so far solved have been those in which the conducting boundary (the electrode) is a perfect conductor. The inclusion of perfectly insulating boundaries is permitted, if they coincide with particular surfaces of flow of the image system. It is evident that, to have no flow normal to (or crossing) an insulating plane, the method of

images requires (a) the representation of the potential field about an electrode by that which would be given if the medium (in our case the electrolyte) were continued indefinitely where the insulator exists, and (b) the replacement of the entire effect of the plane insulator by another electrode of exactly the same type (not the inverse in sign as was the case with a plane perfect electrode), at an equal distance back of the plane. The point to be made clear is that by such a means a mathematician can take account of insulating walls, even to the extent, as will be done in

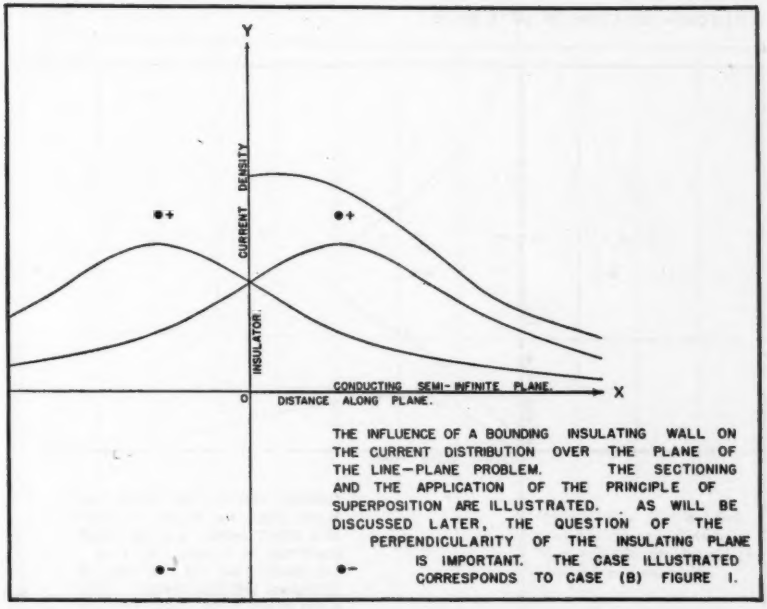

Y
CURRENT DENSITY
INSULATOR
CONDUCTING SEMI-INFINITE PLANE.
DISTANCE ALONG PLANE.
X
O
THE INFLUENCE OF A BOUNDING INSULATING WALL ON THE CURRENT DISTRIBUTION OVER THE PLANE OF THE LINE—PLANE PROBLEM. THE SECTIONING AND THE APPLICATION OF THE PRINCIPLE OF SUPERPOSITION ARE ILLUSTRATED. AS WILL BE DISCUSSED LATER, THE QUESTION OF THE PERPENDICULARITY OF THE INSULATING PLANE IS IMPORTANT. THE CASE ILLUSTRATED CORRESPONDS TO CASE (B) FIGURE 1.

Fig. 5—Influence of an insulating wall at a right angle to the infinite conducting plane.

a later paper, of calculating the quantitative influence of walls on the current distribution over objects.

We will now proceed to derive several interesting cases from the line-plane problem. The only principle involved is that of superposition. If we superpose two solutions of our first problem in the manner shown in Fig. 5, the result is that the line marked Y can be replaced by an insulator and the line marked X by a conductor, a semi-infinite plane. The current distribution can be obtained by superposing two solutions similar to those shown in Fig. 4. The resultant current density at any point on the semi-

infinite plane will be the sum of the ordinates of the two curves at that point. An interesting effect of walls presents itself. It can be readily seen that if the line electrode is distant from the wall marked Y, the maximum current on the semi-infinite conducting plane will appear immediately below it. However, as the line electrode approaches the insulating wall, the maximum will approach the wall more rapidly than does the line electrode. The wall in this case acts as a deflector of the current. The particular position selected in Fig. 5 illustrates this. This corresponds to case B of Fig. 1.

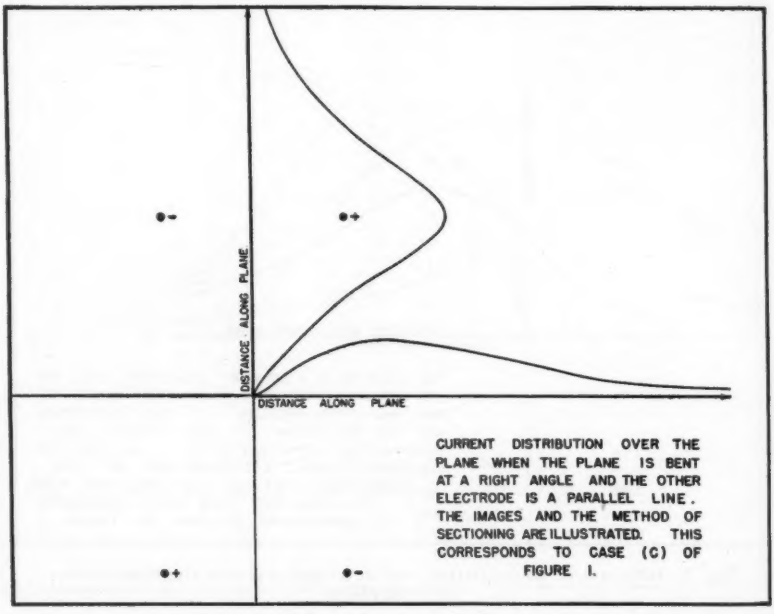

DISTANCE ALONG PLANE
DISTANCE ALONG PLANE
CURRENT DISTRIBUTION OVER THE PLANE WHEN THE PLANE IS BENT AT A RIGHT ANGLE AND THE OTHER ELECTRODE IS A PARALLEL LINE. THE IMAGES AND THE METHOD OF SECTIONING ARE ILLUSTRATED. THIS CORRESPONDS TO CASE (C) OF FIGURE I.

Fig. 6—Current distribution in a right angle with a line electrode.

To solve case C of Fig. 1, we superpose in an inverse manner two solutions of our last problem. The result is illustrated in Fig. 6. If the upper right hand quadrant is sectioned out, we obtain the current flow from a line electrode to an infinite plane electrode bent at a right angle. The current distribution for a special case is illustrated in Fig. 6. Under no conditions will any current enter the corner, if this is an ideal corner. The problem of current distribution in angles is an important one, which

will be considered at a later date for those arrangements that more closely approximate practice.

The problem of a line electrode between two parallel planes (case D of Fig. 1) is of a higher complexity than the preceding ones. It cannot be solved by a simple superposition of two problems. The use of the first "reflections" will not give the plane walls as equipotential surfaces; it is necessary to consider the multiple reflections between surfaces indefinitely. The position of the images and resulting equipotential planes are

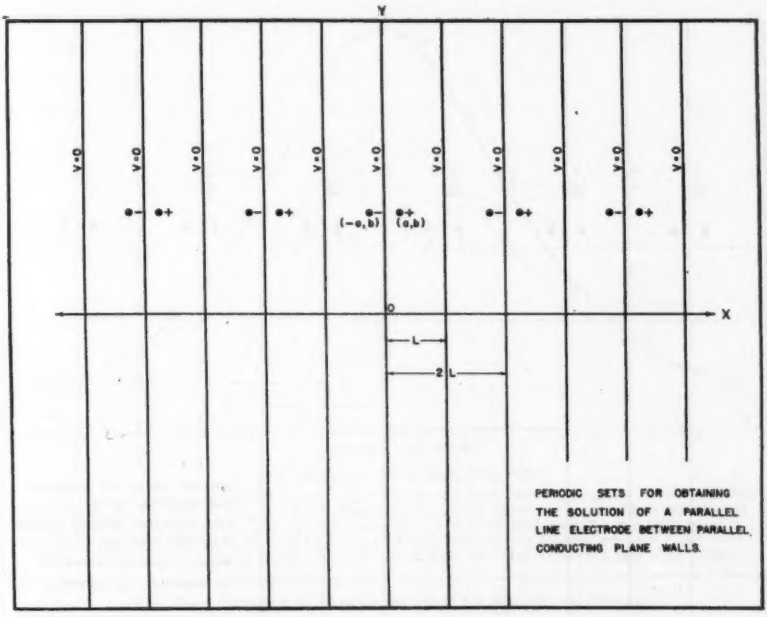


Fig. 7—Mathematical conception of a line electrode between two parallel infinite plane electrodes.

illustrated in Fig. 7, in which the section marked L may be regarded as the initial section. For practical results, only the nearer images need be considered. However, it is possible to express the composite effect in a finite form, as is shown in the appendix. The importance of this problem is that it illustrates the effect of separate objects interacting with each other. In a later paper such a problem will be altered to present the interference of two cylinders. It will then be possible to arrive at definite

ideas about a practice frequently employed in electroplating to obtain a more uniform current distribution;—the mutual interaction of objects and "thieves", that is conducting wires so placed as to attract the current away from certain areas.

Some interesting results can be obtained by superposing two solutions of this last problem in the manner done under the line-plane problem in Figs. 5 and 6. If this is done without reversing the signs, one obtains case E of Fig. 1. The long sides (semi-infinite planes) are electrodes at the same potential, and

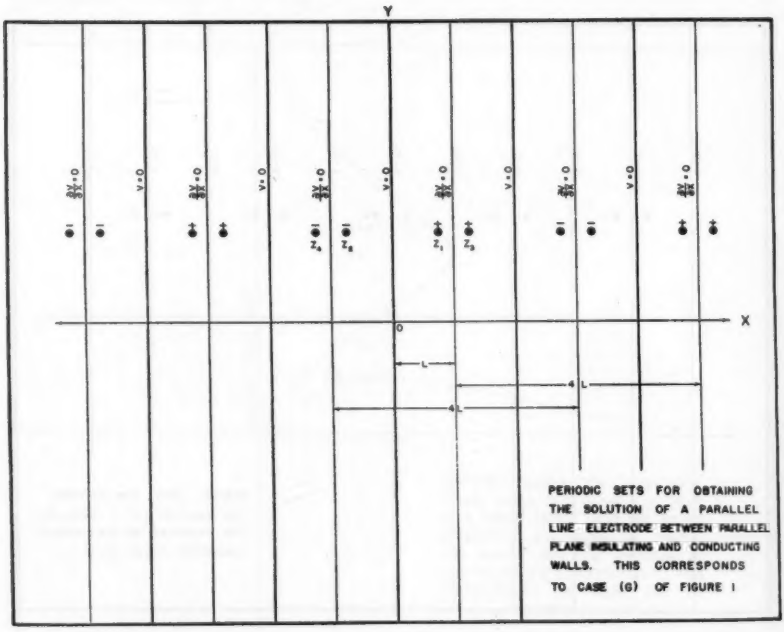

Y
X
L
4L
4L
PERIODIC SETS FOR OBTAINING THE SOLUTION OF A PARALLEL LINE ELECTRODE BETWEEN PARALLEL PLANE INSULATING AND CONDUCTING WALLS. THIS CORRESPONDS TO CASE (G) OF FIGURE 1

Fig. 8—Mathematical conception of a line electrode between two infinite parallel planes one of which is an insulator.

the narrow side is an insulator. However, if the signs of the line electrodes are reversed, all sides of the object (case F of Fig. 1) will be conductors at the same potential. As a result of the foregoing operations we have bent an infinite plane into an object of that type; that is a channel.

Another interesting problem is that (case G of Fig. 1) of a line electrode existing between two parallel walls, one of which is an insulator. The problem is illustrated in Fig. 8 and it is in-

dicated that the multiple "reflections" must be considered indefinitely. The resulting equipotential planes (V=O) and the insulating planes ($\frac{\delta V}{\delta X}$ = O) are indicated. From Fig. 8 the case under consideration can be sectioned out.

It may be seen from Fig. 2 that, since the current flow to the more distant sections of the plane, V=O, involves regions back of the line electrode, the existence of an insulating wall there would interfere with the flow of the current to those sections.

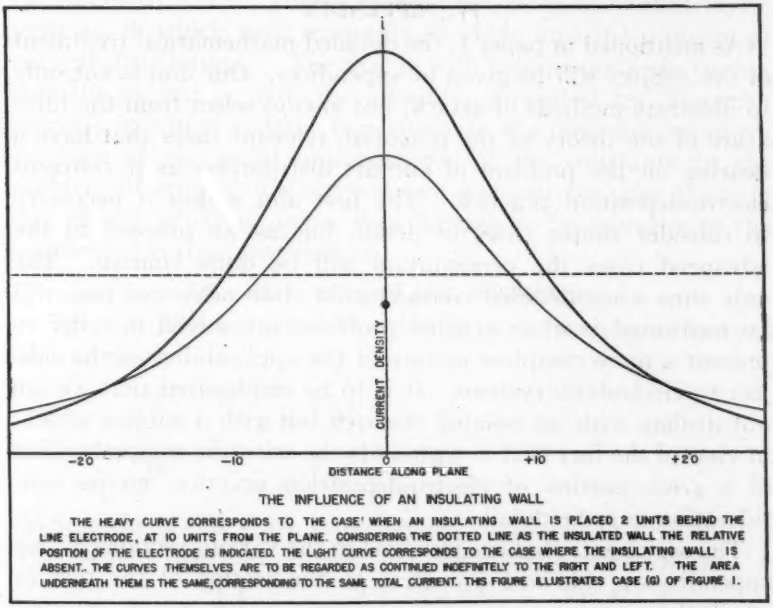

i
CURRENT DENSITY
-20
-10
0
+10
+20
DISTANCE ALONG PLANE
THE INFLUENCE OF AN INSULATING WALL
THE HEAVY CURVE CORRESPONDS TO THE CASE WHEN AN INSULATING WALL IS PLACED 2 UNITS BEHIND THE LINE ELECTRODE, AT 10 UNITS FROM THE PLANE. CONSIDERING THE DOTTED LINE AS THE INSULATED WALL THE RELATIVE POSITION OF THE ELECTRODE IS INDICATED. THE LIGHT CURVE CORRESPONDS TO THE CASE WHERE THE INSULATING WALL IS ABSENT. THE CURVES THEMSELVES ARE TO BE REGARDED AS CONTINUED INDEFINITELY TO THE RIGHT AND LEFT. THE AREA UNDERNEATH THEM IS THE SAME, CORRESPONDING TO THE SAME TOTAL CURRENT. THIS FIGURE ILLUSTRATES CASE (G) OF FIGURE 1.

Fig. 9—Influence of insulating wall on line-plane system.

The insulating wall will cause the current density to change more sharply over the conducting wall. It was with just such a point in mind that Riemann solved the three-dimensional case, which served to call the attention of experimentalists to that condition. The two-dimensional case which is considered here is solved in the appendix. In this case it is necessary to take account of the different sign of the image of the insulator from that of the conductor and, of course, of the infinite multiple reflections.

In Fig. 9, the current density over the conducting wall, the

conducting boundary, is computed for a special case, and is compared with that where the insulating wall is not present.

By superposing two such solutions, we obtain case H of Fig. 1, in which the lower side is a conductor, and the upper and narrow sides are insulators. By considering two such problems in the other manner (inverting one as to the sign of the line electrode), it is possible to obtain case I of Fig. 1, where the narrow side is a conductor rather than an insulator.

IV. APPENDIX

As mentioned in paper I, the detailed mathematical treatment of the subject will be given in appendices. Our aim is not only to illustrate methods of attack, but also to select from the literature of the theory of the potential, relevant cases that have a bearing on the problem of current distribution as it concerns electro-deposition practice. The first aim makes it necessary to consider simple cases in detail, but as we proceed to the advanced cases the presentation will be quite concise. The only time when detailed consideration of an advanced case will be warranted is when original problems are solved in order to present a more complete picture of the applicability of the subject to electrolytic systems. It is to be emphasized that we are not dealing with an isolated research but with a subject which, in view of the fact that it represents the scientific comprehension of a great portion of electro-deposition practice, merits consideration in some detail.

The arguments that are involved in the various sections of this appendix are classified according to the section of the text in which they occur.

II. POINT-PLANE PROBLEM
(Three-Dimensional)

We derived as the potential function for two point electrodes.

$$(5)\quad V = \frac{I}{4\pi K}\left(\frac{1}{r_1} - \frac{1}{r_2}\right) = \frac{I}{4\pi K}\left[\frac{1}{(x^2+y^2+(z-a)^2)^{\frac{1}{2}}} - \frac{1}{(x^2+y^2+(z+a)^2)^{\frac{1}{2}}}\right]$$

The current distribution over the plane $z=0$ will be

$$(6)\quad i = -K\frac{\delta V}{\delta z}\Bigg]_{z=0} = -\frac{I}{4\pi}\cdot\frac{2a}{(x^2+y^2+a^2)^{\frac{3}{2}}} = -\frac{Ia}{2\pi r^3}$$

It was from the last equation that Fig. 3 was drawn.

It is to be noted that the form is independent of the conduc-

tivity. This will always be the case if the medium is homogeneous and no polarization exists.

In order to have the potential of the plane z=O everywhere different from zero by a constant amount, it is necessary only to add that constant to the potential function. The introduction of such a constant will alter the total current flow[12], but it will not affect the current distribution. In the theory of the potential it is axiomatic that a constant polarization has no effect on the current distribution. There are two cases, peculiar to electrolytic systems, in which such constants do enter into the problem of current distribution. The first is with intermediate electrodes, and the second is with the situation presented by "covering power", in which at least two alternate reactions are involved. In view of the usual unimportance of the constants to the problem of current distribution, we will not consider them in any of our solutions unless they happen to be relevant to the problem of current distribution.

III. THE LINE-PLANE PROBLEMS

Case A. The potential function of two line electrodes was derived as:

$$(7)\quad V = \frac{I}{2\pi K} \log \frac{r_2}{r_1}$$

$$(8)\quad = \frac{I}{4\pi K} \log \frac{x^2+(y+a)^2}{x^2+(y-a)^2}.$$

(Where the x and y are interchanged compared to Fig. 2). The current distribution over the plane (line) y=O will be

$$(9)\quad i = -K\frac{\delta V}{\delta y}\Big]_{y=O} = \frac{-I}{4\pi}\left[\frac{2(y+a)}{x^2+(y+a)^2} - \frac{2(y-a)}{x^2+(y-a)^2}\right]_{y=O}$$

$$(10)\quad = -\frac{Ia}{\pi r^2}$$

The last equation is that from which Fig. 4 was computed.

Case B. The second example is the superposition of two such problems, as is illustrated in Fig. 5.

The potential function will be

$$(11)\quad V = \frac{I}{4\pi K} \log\frac{(x-b)^2+(y+a)^2}{(x-b)^2+(y-a)^2} + \frac{I}{4\pi K} \log\frac{(x+b)^2+(y+a)^2}{(x+b)^2+(y-a)^2}$$

[12]Strictly speaking, the resistance of a system that contains a point or line electrode is infinite, but from the fact that the equipotential surfaces in the neighborhood of the point or line become very close approximations to concentric spheres or concentric cylinders, the calculations do apply to the case when comparatively small spheres or cylinders are regarded as the electrodes. The above point then applies.

For the current distribution over the line y=O,

$$(12)\quad i = -K\frac{\delta V}{\delta y}\Big]_{y=O} = \frac{-Ia}{\pi}\left[\frac{1}{(x-b)^2+a^2} + \frac{1}{(x+b)^2+a^2}\right].$$

For the quadrant designated x=O, it can be shown that $\frac{\delta V}{\delta x}\Big]_{x=O}=O$.

Hence the flow through that boundary is zero, and it can be regarded as an insulator. It is from the equation given that Fig. 5 was drawn.

Case C. When it is desired to make conductors both sides of the quadrant, the second part of the potential function of Case B is changed as to sign. This takes account of the change in sign of the electrodes of Fig. 6 as compared to Fig. 5. The potential function will then be

$$(13)\quad V = \frac{I}{4\pi K}\log\frac{(x-b)^2+(y+a)^2}{(x-b)^2+(y-a)^2} + \frac{I}{4\pi K}\log\frac{(x+b)^2+(y-a)^2}{(x+b)^2+(y+a)^2}$$

The current distribution over the line y=O, will be

$$(14)\quad i = -K\frac{\delta V}{\delta y}\Big]_{y=O} = -\frac{Ia}{\pi}\left[\frac{1}{(x-b)^2+a^2} - \frac{1}{(x+b)^2+a^2}\right].$$

The current distribution for the line x=O will be

$$(15)\quad i = -K\frac{\delta V}{\delta x}\Big]_{x=O} = -\frac{Ib}{\pi}\left[\frac{1}{b^2+(y+a)^2} - \frac{1}{b^2+(y-a)^2}\right].$$

These last two equations are the forms from which Fig. 6 has been drawn.

For simplicity of presentation, it is to be noted that E and F are obtained from D, and H and I are obtained from G in exactly the same manner as B and C are obtained from A. Consequently, it will be necessary only to indicate the steps in arriving at the potential function. The manner of obtaining the current distribution function is to be understood.

Case D. The line electrode between two parallel conducting planes. The operation employed in this problem represents an important tool available to mathematicians; for example, Cases D and G are resolvable by it, and in later papers we will have occasion to employ it again. For that reason it will be considered in some detail, and when employed will be referred to as a periodic transformation.

What we seek is the resultant potential of an indefinite set of images, illustrated in Fig. 7. It is necessary in problems of this type to employ complex variables.

The complex potential function of the set next to the axes is

$$(16)\quad -W' = \frac{I}{2\pi K} \log \frac{z-a-ib}{z+a-ib}\,;\; z = x+iy\,.$$

The real part of this function is the potential function of that set. The problem resolves itself into constructing a periodic set which repeats itself at intervals of 2L. Then, by sectioning out a width L we have the problem of a line electrode between two planes.

This periodic set will be

$$(17)\quad -W = \frac{I}{2\pi K} \sum_{-\infty}^{+\infty} \log \frac{z-a-ib+2Ln}{z+a-ib+2Ln}\,.$$

For convenience set

$z-a-ib = z'$
$z+a-ib = z''$

Then

$$(18)\quad -W = \frac{I}{2\pi K} \log \frac{z'}{z''} + \frac{I}{2\pi K} \log \prod_{1}^{\infty} \left[\frac{z'^2-(2Ln)^2}{z''^2-(2Ln)^2} \right]$$

$$(19)\quad = \frac{I}{2\pi K} \log \left[\frac{\dfrac{z'\pi}{2L}}{\dfrac{z''\pi}{2L}} \prod_{1}^{\infty} \left(\frac{1-\left[\dfrac{z'\pi}{L}\cdot\dfrac{1}{2\pi n}\right]^2}{1-\left[\dfrac{z''\pi}{L}\cdot\dfrac{1}{2\pi n}\right]^2} \right) \right].$$

Apply Euler's expansion for the sine

$$(20)\quad \sin\frac{z}{2} = \frac{z}{2} \prod_{1}^{\infty} \left[1-\left(\frac{z}{2\pi n}\right)^2 \right],$$

and then we have

$$(21)\quad -W = \frac{I}{2\pi K} \log \left[\frac{\sin\dfrac{z'\pi}{2L}}{\sin\dfrac{z''\pi}{2L}} \right]$$

$$(22) \quad = \frac{I}{4\pi K} \log \left[\frac{1 - \cos \frac{\pi}{L}(z-a-ib)}{1 - \cos \frac{\pi}{L}(z+a-ib)} \right].$$

Taking advantage of the imaginary periodicity of hyperbolic functions we obtain

$$(23) -W = \frac{I}{4\pi K} \log \left[\frac{1-\cos\frac{\pi}{L}(x-a)\cosh\frac{\pi}{L}(y-b)+i\sin\frac{\pi}{L}(x-a)\sinh\frac{\pi}{L}(y-b)}{1-\cos\frac{\pi}{L}(x+a)\cosh\frac{\pi}{L}(y-b)+i\sin\frac{\pi}{L}(x+a)\sinh\frac{\pi}{L}(y-b)} \right],$$

and extracting the real part we have

$$(24) \quad -V = \frac{I}{4\pi K} \log \left[\frac{\cos\frac{\pi}{L}(x-a) - \cosh\frac{\pi}{L}(y-b)}{\cos\frac{\pi}{L}(x+a) - \cosh\frac{\pi}{L}(y-b)} \right].$$

Equation (24) represents the potential function that is sought. For convenience set b=O, namely, the electrode exists on the x axis. Then the forms for the current distribution over the two planes x=O, and x=L, will be:

$$(25) \quad i_{x=O} = -K\frac{\delta V}{\delta x}\Big]_{x=O} = -\frac{I}{2L} \cdot \frac{\sin\frac{\pi a}{L}}{\cosh\frac{\pi y}{L} - \cos\frac{\pi a}{L}}$$

$$(26) \quad i_{x=L} = -K\frac{\delta V}{\delta x}\Big]_{x=L} = -\frac{I}{2L} \cdot \frac{\sin\frac{\pi a}{L}}{\cosh\frac{\pi y}{L} + \cos\frac{\pi a}{L}}.$$

These two equations are the forms of interest.

Case E. This can be obtained by superposing two solutions of Case D, in the manner that B was derived from A.

Case F. This can be obtained by superposing two solutions of Case D in the manner that C was derived from A.

Case G. This is the problem of a line electrode between two parallel planes, one of which is an insulator. This is obtained by

considering the periodic arrangement shown in Fig. 8. The important point to note is that in order to bring in the insulating plane it is necessary to consider two sets of electrodes, which we have indicated in the figure. The coordinates are $z_1 = a + ib$, $z_3 = 2L - a + ib$, $z_2 = -a + ib$, and $z_4 = a - 2L + ib$.

It then follows that the complex potential function of that set will be:

$$(27)\quad -W' = \frac{I}{2\pi K} \log\left[\frac{z-a-ib}{z+a-ib}\right] + \frac{I}{2\pi K} \log\left[\frac{z-(2L-a)-ib}{z+(2L-a)-ib)}\right].$$

The interval at which we wish them to repeat themselves is 4L. Proceeding in the same manner as under Case D, we obtain the potential function that is desired,

$$(28)\quad -V = \frac{I}{4\pi K} \log\left[\frac{\cos\frac{\pi}{2L}(x-a) - \cosh\frac{\pi}{2L}(y-b)}{\cos\frac{\pi}{2L}(x+a) - \cosh\frac{\pi}{2L}(y-b)}\right]$$

$$+ \frac{I}{4\pi K} \log\left[\frac{\cos\frac{\pi}{2L}(x+a) + \cosh\frac{\pi}{2L}(y-b)}{\cos\frac{\pi}{2L}(x-a) + \cosh\frac{\pi}{2L}(y-b)}\right].$$

In the type of problem illustrated in Fig. 9, the location of the line electrode in the y direction is immaterial, so we will consider that b=O. The current density over the boundary x=O, will be

$$(29)\quad i_{x=O} = -K\frac{\delta V}{\delta x}\Big]_{x=O} = -\frac{I}{4L}\left[\frac{\sin\frac{\pi a}{2L}}{\cosh\frac{\pi y}{2L} - \cos\frac{\pi a}{2L}} + \frac{\sin\frac{\pi a}{2L}}{\cosh\frac{\pi y}{2L} + \cos\frac{\pi a}{2L}}\right].$$

It is from this last equation that the curve showing the influence of the back wall in Fig. 9 was drawn.

Case H. This can be obtained from G in the same manner as B was obtained from A.

Case I. This can be obtained from G in the same manner as C was obtained from A.

SUGGESTIONS

PERTAINING

"INTERNATIONAL CONVENTION"

AMERICAN ELECTROPLATERS' SOCIETY
(NEWARK BRANCH)

AT ASBURY PARK, N. J.

June 19th, 20th, 21st, 22nd

1939

•

MANUFACTURERS: — Deferring Your Plans for the Exhibit Will Not Afford Choice Reservation. Contact Now, It Is to Your Advantage.

PLATERS: — Convention and World's Fair Attractions Should Warrant Your Attendance. Remember the Dates When Planning Your Vacation.

CHEMISTS: — Location of Convention City is Accessible by All Modes of Travel. It is Not Too Early to Plan Attendance.

TO ALL INTERESTED: — This Gathering is to be One of the Foremost. *Hear It — See It — Attend It.*

•

For Full Information

Write

NEWARK BRANCH, A. E. S. HOTEL DOUGLAS, NEWARK, N. J.

Bright Nickel Plating

By O. A. STOCKER

Read at Waterbury and New Haven Branches and at Chicago Annual Meeting, January 28, 1939

BRIGHT NICKEL plating processes command an ever-increasing interest in the metal finishing trade, since they have come into general use during the past few years. While bright nickel deposits have been produced as long as 15 years ago, it is only since heavy bright deposits can be successfully secured that the general interest has grown. Processes that can be operated at high current densities, day after day, on regular production, with freedom from shut-downs, naturally open up possibilities for wide use in the plating trade.

A brief mention of the use of brighteners in cold nickel baths might be of interest. The use of certain gums, gelatins, and sugars in nickel baths gave bright deposits at low current densities but their use was limited to thin plates. Likewise zinc and cadmium additions produced bright deposits, but such plate was apt to be brittle, and the use of such substances was attended with trouble as the concentrations were very critical. Such home-made bright nickel baths were not particularly successful in production. The modern bright nickel processes, produced after considerable research and experimentation, offer reasonable assurance of high speed bright nickel plating with a minimum of trouble.

In this general discussion, all reference to any particular process will be avoided. They may be classified in two groups, one of which uses only organic compounds to secure the brightening effect, while the other group employs both organic and metallic compounds.

The actual theory of bright nickel deposition is not known, but stated in a simple manner, it is assumed that dull nickel crystals do not orientate themselves perfectly while being deposited, so that the resultant plate consists of a series of microscopic elevations and depressions which can only reflect diffused light, giving a dull effect, while a bright nickel deposit is a flat, mirror-like surface, perfectly plane and free from uneven crystal growth, so that light is perfectly reflected, giving a brilliant, bright appearance. What changes take place at the cathode to produce

this, are not exactly known, but it is evident that the addition of certain organics and metallo-organic compounds produce a deposit of entirely different characteristics than from an ordinary nickel bath.

The mechanism involved in depositing bright nickel crystals on a cathode is probably very delicate and demands, therefore, rigid control of such operations as can be regulated, so as not to interfere with the inherent property of the brightening agent in the bath to produce the uniform nickel crystals necessary to give a bright finish.

It is a fact that bright nickel processes require considerably more care in control and operation than do the dull nickel baths. There is considerable similarity between such processes and the chromium plating bath. Both processes require high current densities as compared to cold nickel plating, hence demand care in racking so that positive contact with the work is assured. In some instances, the rack must be designed to protect against too high a current density on projections and edges, and care must be observed in securing the best throwing power in recesses. Racking of articles too closely together must be guarded against to prevent shading, for any change in the color of the bright deposit is noticeable and must be avoided, since there is no color buffing to remove such variations as in dull nickel plating.

There is also a similarity between chromium plating and bright nickel plating in regard to the difficulties attached to the first use of both processes. It requires little searching of the memory to recall that the pioneers in chromium plating had lots of grief until familiarity with the process and its control simplified the use. The pioneer users of bright nickel processes likewise were beset with troubles and many a production department was the proving ground for such processes, until both user and vendor acquired the knowledge necessary to make such processes practical. There is no question as to the value of bright nickel plating, as regards economy. First of all, the most obvious saving is the elimination of the final color buffing, and the ability to route such work directly to the chromium tanks and to chromium plate on the same rack if desired. Second, the use of high current densities cuts down the plating time and speeds up production. Third, the elimination of color buffing makes rejects due to cutting-through of the deposit on edges and projections a thing

of the past. Fourth, the fact that less handling of work will be necessary, cuts the labor cost. Fifth, if for any reason color buffing is found to be desirable, it will be only necessary to lightly wipe a proper bright nickel deposit to get the highest lustre.

To properly discuss bright nickel processes, certain qualifications of such deposits should be stated. A bright nickel deposit should maintain its lustre at all thicknesses of plate, and the deposit should be inherently bright. The plate should be ductile, so as to allow mild forming operations on the article plated, without cracking of the deposit. The nickel should be soft and easy to wipe to a high lustre if necessary. The deposit should be free from pores and as corrosion resistant as dull nickel. No treatment should be necessary before chromium plating.

In regard to the baths, they should have certain qualifications. The organic compounds should be stable and not decompose to bring about dullness of plate. The solution should not be too sensitive to impurities, although contamination of a bright nickel bath should be avoided. The operating limits, as regards temperature, current density, pH, and concentration of various ingredients, should be wide. The bath should have good throwing power.

In general, the *baths* used vary in *nickel sulfate concentration* between 20 and 40 ounces per gallon, with *nickel chloride* content between 4 to 8 ounces per gallon. They are well buffered with *boric acid*, generally 4 to 6 ounces per gallon, and the *pH* varies from 2.0 to 4.5 electrometric. Each process has its limits of *temperature* ranging from 85° to about 160° F., with *current densities* ranging from 5 to 120 amperes per square foot. Certain ones will work without *agitation*, others will require constant agitation, and circulation, while others will work equally well in a still tank or automatic tank where the cathode moves slowly.

One process may be limited to a very narrow range of *pH*, or *temperature*, or *current density*, while another may have a wide operating range. The *color* and *brightness* of deposits from the various processes differ. The ease of control and stability of each bath differs, as does the ductility and softness of the deposit, all of which are factors to be individually considered and investigated by prospective users of bright nickel.

The preparation of the *base metal* is important, in that all bright nickel deposits are transparent and any defects in the base

metal, such as scratches, pits, or lack of good polishing, are magnified or enhanced. Preparation of the base metal must of necessity be better than for dull nickel, for in the absence of the nickel coloring operation, the final coloring should be on the base metal.

For deposits on the order of .0002″ of bright nickel directly on a base metal, the final finish in the base metal should be a color buff. This applies particularly to copper and brass, which do not need a heavy coat of nickel to withstand corrosion. For die-castings of zinc, which require a much heavier plate for corrosion resistance, the polishing operation need not be so fine, since such a base metal requires a preliminary deposit of copper or dull nickel before bright nickel plating, and deficiencies in the base metal preparation are somewhat covered up. Steel articles having a good rolled finish need not be polished as the bright nickel deposit will be over .0005″ thick, while for high grade steel articles a fine polish is desirable to remove such imperfections as pits, cold shots, inclusions, and scratches. Sheet metal stampings, free from die marks, can be bright nickel plated without preliminary polishing, and good finish secured. Bright dipped brass can be bright plated although it requires about a minimum of .0002″ to affect a good finish on a matte surface. Articles made of wire can be plated with a good bright surface without preliminary burnishing, since a round surface with a small diameter will not show imperfections as a flat surface will.

Most bright nickel deposits attain an increased lustre as the *thickness* of the deposit increases, which is very desirable. Some processes can be applied directly over unbuffed copper deposits and good bright plate secured. *Zinc Base die-castings* are plated in this manner, using about 15 minutes of Rochelle Salt Copper with a thickness of .0003″ to .0005″ copper. *Zinc base alloys* cannot be plated directly in any bright nickel bath, due to the low pH used, and the preliminary copper deposit must be free from pores and must completely cover the zinc alloy to avoid contamination of the bath. Die-cast nickel can be the undercoating, as it has good adherence, and a proper bright nickel will adhere to the dull nickel deposit.

The matter of *adherence* of bright nickel deposits is important, and on this subject it must be said that the adherence, which varies with the type of bright nickel, is not quite as good as that

of dull nickel. To secure the best adherence sometimes involves some changes in the cleaning cycle. The cleaning must be perfect since, as one theory explains it, bright nickel crystals are supposedly much smaller than those of dull nickel, and it can seem plausible that a few microscopic specks of oxidation or dirt on a base metal might be larger than the crystal itself, resulting in no adherence at that particular spot, while a dull nickel crystal might easily cover such an area completely and anchor itself to the base metal at several points. Properly cleaned, bright nickel can be deposited on thicknesses of .001" and over directly on steel and undergo severe bending without any separation. Over copper and brass, the problem of adherence is not as critical.

The *ductility* of bright nickel varies with the process and conditions, and the plate may be extremely soft and ductile, or under improper deposition it may be brittle. This characteristic may be found in both classes of processes, and it is not found specifically in the so-called "alloy" plates. Excess of organics may cause brittleness. Properly deposited, bright nickel plate will be found to be capable of mild forming operations without cracking. As compared to dull nickel deposits, the ductility of high current density deposits is somewhat less.

The *cathode efficiency* of bright nickel processes varies from about 90 to 98%. Any tendency to gas with resultant pitting is avoided in most cases by the use of organic anti-pit agents, which have the property of lowering the surface tension of the bath down to a point where the gas bubble will not adhere to the work being plated, but goes sliding off because of its buoyancy with the resultant absence of gas pitting. Hydrogen peroxide cannot be used with the majority of bright nickel baths as it destroys the organic compounds in the bath.

In regard to *cleanliness* of the baths, it is important in all high current density plating that no foreign particles, however minute, are allowed to float about, because they will impinge on the cathode with resultant rough plate. It is necessary to filter a bath when rough plate does occur. In most processes, this operation entails no trouble, although a filtering apparatus suitable for low pH baths is generally necessary to prevent contamination of the bath by foreign metals. Baths must be kept free from oils and greases by proper precautions.

Bright nickel baths are more sensitive to *impurities* than dull nickel baths, and they must be guarded against contamination from foreign metals and harmful organics. Copper, iron, lead, etc. in amounts less than 0.01 ounces per gallon will cause trouble, such as darkening of the deposit in recesses, and possible embrittlement of the plate. Organic impurities, such as might come from buffing compounds left on work, or from organic substances absorbed from a rubber tank lining which was not compounded for a hot organic type bright nickel bath, will cause fogging of the deposit or brittleness. Such impurities can now be removed by proper treatment, and their presence does not mean the dumping of a bath, as it formerly was necessary to do. It is important to select the proper rubber lining for the process intended to be used, and in this matter, the supplier of tanks should be specifically consulted. A rubber lining compounded for a cold nickel bath or for an acid dip tank may poison a hot organic bright nickel bath and cause considerable trouble.

Bright nickel baths containing wetting out agents have a very low surface tension of about 32 to 37 dynes per cm. Grease from any source, as from buffing compounds left on work, will not float to the surface to be skimmed off and removed, but will be incorporated in the bath to cause lack of adhesion or fogging of the plate. Organic impurities introduced by the breaking down of the original brightening agent may cause loss of brilliance. The only possible manner in which to remove organic impurities is to treat the bath by continuous filtration for a time through a filtering apparatus charged with a suitable activated carbon, which has an affinity for such materials. The details of such treatment are given in an excellent article by Mr. Helbig in the "*Metal Industry*" of December, 1938, so that the details will be omitted here. To remove substances such as mineral oils or lubricating oils, a similar treatment with an activated clay is required.

Metallic impurities can be removed by dummy plating of a bath using a cathode current density of 2 to 4 amperes per square foot or by raising the pH to over 6.0 with lime and nickel carbonate, adding hydrogen peroxide, and filtering.

In regard to *filtration* and *purification* of the bright nickel bath after installation, each bath is affected in a different manner, some losing certain of their brightening constituents through

ordinary filtering, and others being affected by a purification requiring dummy plating at low current densities or raising of the pH to above 6.0 with lime and nickel carbonate. Loss of brightening agents through just ordinary filtration is somewhat of a costly factor, as the bright nickel baths must be kept clean and may occasionally require frequent filtration. The loss of brighteners through purification treatment is not so much a matter of concern, for if the bath is properly controlled and kept free from contamination, such purification should not be required.

In regard to the necessity of a clean bath, the subject of proper *anodes* and anode bags is pertinent. Bright nickel baths operating as they do from a pH of 2.0 to 4.5 in hot solutions at high current density, demand anodes different from those used in high pH, cold nickel baths. While almost any anode will corrode under such conditions as present in the bright nickel bath, with a fairly high chloride content, most anodes do not corrode or dissolve completely without the formation of loose undissolved particles of nickel, which are sometimes so fine that they get through the anode bags into the bath, with subsequent rough plate. A proper anode for such baths is one that will dissolve with high anode efficiency, at high current densities, with no loose nickel formed, and with the least formation of necessary non-metallic sludge. The anode sludge should be of a nature that it will be retained inside of the anode bags, and not so fine that it will seep out into the tank. The bags must be made of heavier material than used in cold solutions, must be of unsized material, and must be resistant to disintegration from the acid baths. The bags now available for use include woven glass bags, bags comprising an outer cloth bag and an inner filter paper bag, and bags of cloth only, selected to meet the necessary requirements.

The *throwing power* of bright nickel baths is a factor of interest, and while it is generally true that dull cold baths have perhaps better throwing power, certain bright nickel processes have the ability to deposit bright plate in recesses of appreciable depth. This property varies with the process, and it is conceded that a hot nickel bath is slightly inferior to a cold bath in this respect. The throwing power appears to be benefitted by high current density and high nickel content. Violent agitation of the solution or rapid agitation of the cathode affects this property adversely, but satisfactory results in production are secured with

several processes, on articles requiring excellent throwing power.

Regarding control of a process, it is decidedly advantageous to be able to check the concentration of the brightener by a simple analytical method, as it avoids visual control, where the need for brightener additions is indicated only when several racks of work have come out of the bath with reduced brilliance.

Bright nickel plating has a definite field in the metal finishing industry, but it cannot work miracles. It's application to a particular plant must be studied and carefully considered before an installation is made. On base metal of poor finish, as on goods selling cheaply in a highly competitive field, where polishing of the base metal is not a part of the cycle, the imperfections will be visible. A very passable product may be secured by depositing a thin coat of copper followed by a light coloring operation, and finished with bright nickel. On articles having a preliminary polishing and coloring operation before plating, followed by bright nickel, very satisfactory results are secured. On articles requiring a highly finished surface, bright nickel does an excellent job, since such articles are highly polished before being bright nickeled. The main savings attached to bright nickel plating is the elimination of the final coloring before chromium plating and the elimination of the handling and drying of the work between the nickel bath and the coloring operation. In many cases the final coloring is eliminated but an additional coloring before nickel plating is required. The savings are concrete, since it must be borne in mind that because no coloring is done on the bright nickel, less plate is required as there is no danger of work being cut through on edges, corners, and projections. As a matter of fact, such points, formerly the cause of rejects, receive a heavier plate than the central flat areas of a piece, which gives added protection. With dull nickel, 20 to 30% additional thickness of nickel must be put on to allow for cutting down in the coloring operation.

We have drawn up a list of precautions which should be observed in the operation of a bright nickel bath, many of which are general knowledge, but which we all need to be reminded of occasionally, and to conclude this talk, I will discuss them briefly.

BRIGHT NICKEL PLATING

1. Use only a tank that has a rubber lining approved for use with hot organic Bright Nickel Baths.

This is of extreme importance, as stated before, since considerable trouble

can be caused by organic contamination. It requires only a very small amount of an organic substance to give a bath bright properties, so that it is obvious an equally small amount of a harmful organic may cause trouble.

2. Use only a Watts' bath of the formula recommended and purified as outlined in the Instruction Sheets.
Each process has a particular concentration of nickel salts and boric acid considered best, and these concentrations should obviously be maintained.

3. Use only properly cast 99% Plus anodes preferably, or rolled depolarized anodes, bagged with suitable heavy, free from sizing, bags. If anodes have been used previously in another bath, they must be *absolutely* clean before use in a Bright Nickel Bath.
The proper anodes and bags should be recommended by vendors of each process.

4. Use only lead heating coils placed at ends of tank, and NOT behind anodes. Keep anodes at least *a foot away* from coils so that the lead will not act as an anode.
Lead heating coils appear to be most suitable for low pH baths. Since there is a high chloride content in most bright nickel baths, and lead chloride is soluble in hot solutions, any effort to keep the lead from dissolving is worthwhile.

5. Use only *pure nickel* hooks on anodes and keep solution level below tops of anodes.
Since most nickel anode hooks are of monel metal, an alloy containing nickel, and copper, there is a possibility of some anodic solution of such hooks, resulting in copper contamination of the bath with resultant trouble.

6. Use all of the Make-Up sent for the installation, dissolving out any semi-solid matter left in the carboys with hot water, and when dissolved, adding the solution to the bath proper.
In converting a bath into a bright nickel bath, in the absence of a process representative, it is wise to follow instructions implicitly.

7. Use water that is not dirty or rusty for making up or raising level of the bath.
Such water is an easy source of contamination and should be avoided.

8. Use care to be sure that the anode and cathode bars and the steam coils are electrically insulated from one another and from the tanks.
This precaution is important to prevent shorts, and to guard against the lead coil becoming anode or cathode.

9. Do not leave work suspended in bath for long periods of time with no current flowing, as some dissolving of the base metal may take place.
This is another precaution against bath contamination.

10. Do not rack in haphazard fashion. Attention should be given to securing firm and clean contacts, as in chromium plating, so as to insure minimum gassing, minimum burning at corners and edges, and maximum throwing power.
Self-explanatory. High current density demands better racking.

11. Do not plate over stripped work unless the previous deposits have been *completely removed*.
A precaution against peeling of the subsequent plate.

12. Do not forget to recover *immediately* all articles lost or dropped in the tank.
A precaution against bath contamination.

13. Do not expect Bright Nickel to adhere to unclean surfaces; dull nickel does not.
A clean surface before plating is extremely important, as stated before, since the adhesion of bright nickel is slightly inferior to that of dull nickel.

14. Do not stir bath just before using as rough plate may result from sediment put in suspension. *Stir bath at night after plating has stopped.*
This applies to all plating baths.

15. Do not fail when cleaning anode bars to keep paper underneath so that metal and emery dust will not fall into the bath, thereby contaminating it.
Another precaution against solution of foreign metals.

16. Do not fail to keep anode bars covered so that dripping solution will not dissolve copper into the bath.
As above.

17. Do not use a filtering apparatus which has iron or copper alloy in the system.
A filtering apparatus for low pH baths should be made of metals not soluble in such solutions. All parts in contact with the solution should be of a corrosion resistant alloy or metal, or covered with a proper rubber covering. This excludes copper, brass and plain iron or steel.

18. Do not forget to avoid contamination of the bath from leaky steam coils, dust and dirt in the air, and dirt carried into the bath from work not properly cleaned. All bright nickel baths are sensitive to impurities.
Leaky steam coils are a source of iron contamination.

19. Do not get any chromic acid into the bath.
Chromic acid causes peeling in any nickel bath. Racks used for both bright nickel and subsequent chrome plate should be carefully washed before going through the cycle again.

20. Do not use ammonia or ammonium salts; raise pH with Nickel Carbonate.
Ammonia or its salts have a tendency to cause brittle deposits in most hot nickel baths, with the exception of one process which uses it in the formula.

21. Do not forget to keep within operating limits set in the Instruction Sheets, unless otherwise specified.
This is important as a means of proper control.

22. Do not fail to check pH and temperature first in case any variation in plating occurs.
Most troubles in bright nickel solutions occur from a gradual change of pH until it is outside the proper range, or from a sudden rise or fall in temperature.

23. Do not expect the bath to operate satisfactorily when analysis shows factors off standard.
Proper concentrations of all ingredients produce most satisfactory results.

24. Do not add replenishment solutions unless when indicated by analysis, or advised by the laboratory. Do not experiment with the bath.
Self-explanatory.

25. Do not fail to see that all additions are diluted with ten times their volume with a portion of the bath outside the tank before adding to the main bath.
Advisable for most processes to insure proper mixing.

26. Do not forget that as the brightener content increases, the current density may be slightly increased.

27. Do not use any type of violent agitation and bear in mind that any agitation demands increased current density.

28. Do not allow the anode area to become too much decreased by failure to replenish with new anodes, as the current capacity of the tank will also decrease.
Very important as the current capacity of a bath is limited by too small an anode area. Likewise the nickel content will decrease.

29. Do not fail to purify all Nickel Salts added to the bath.
All nickel salts contain small amounts of metallic impurities, and in concentrated baths enough may be present to cause trouble. Purification of nickel salts is of value even for dull nickel baths.

30. Do not forget to hang freshly plated dummies in tank overnight to plate out any copper in the bath. This can be done without current flowing.
Copper plates out readily by immersion on nickel plated dummies and this is a means of removing it.

31. Do not fail to control amperes when loading or unloading tank.
Since all plating processes have a definite range of C.D., this must be controlled.

32. Do not fail to contact the laboratory at any sign of trouble.
Self-explanatory.

33. Do not blame the PROCESS for every difficulty met with in its use, as most trouble is caused by something prior to plating, such as improper cleaning, improper racking, etc. Keep in mind that Bright Nickel Plating, like Chromium Plating, must be properly controlled to produce the best results.

In conclusion, I would like to state that there is a very definite use for bright nickel as evidenced by the many successful installations in operation. As knowledge of the operation of such processes increases, the applications will increase until its use will be general where savings can be effected. In regard to the present processes, it is only honest to say that the perfect process is not yet on the market, and that close production control is imperative, for successful operation. Service by technical men will undoubtedly be required from time to time, so that the availability of such service is of prime importance to the user.

The natural trend of the finishing industry will be toward securing better finished base metal and modern equipment, so that the adoption of a bright nickel process with its evident economy will not involve the heavy initial expenditure it now requires in so many plants.

The following is a summary on the notes on Dr. Louis Weisberg's talk entitled, "PURIFYING OF BRIGHT NICKEL SOLUTIONS"

This talk on purification methods is for Bright Nickel Solutions but the same methods could easily be adapted for use in purifying any Nickel Solution.

There are two types of impurities which must be removed (a) organics (b) metals. The most common organic impurities are Sizing and Oil. Sizing may come from barrels or bags which are used as containers for the salts. Oil might come from mechanism over the plating tank.

The main metallic impurities encountered are: lead, copper, iron, zinc and chromium. The iron might come from Nickel salts, copper from scraping the bus bars, zinc from plating recessed die castings and lead from a steam coil.

In the purification of organics the most recent method for this is the filtration of the solution through activated carbon, which is really high grade charcoal. The best way to do this is to put the activated carbon in a filter press so that the solution has to pass through the carbon before it goes through the cloth. This is a process of purification by absorption and has been found to be very efficient for oil, sizing and similar materials.

A chemical method of accomplishing the same purpose, which has not as yet become as popular as the above, is the use of Potassium Permanganate, which is an oxidizing agent. In the use of this method, the solution is brought to a pH of 2, warmed up, and 3 lbs. of Potassium Permanganate are added to 1000 gallons of solution. This is allowed to stand several hours so that the Potassium Permanganate can oxidize the impurities. The solution is then allowed to cool and the pH brought up with Nickel Carbonate until the Permanganate precipitates out as manganese dioxide, which can readily be noticed by the disappearance of the purple color. The pH of the solution can then be adjusted to whatever point is desired for operation.

Another chemical method of oxidizing organic impurities is to introduce chlorine gas into the solution. This method is rather difficult to use if the proper equipment is not available but it has the advantage in the fact that it introduces no foreign materials into the bath and the only effect is to slightly increase the chloride content of the solution.

The most popular method of purifying nickel solutions and one which has been used for many years is called Liscomb's method. This method will purify the nickel solution of some organics but its main application is in the removal of small amounts of metallic impurities. It has been found effective for removing zinc, copper, lead, chromium sometimes and some organic compounds and Dr. Weisberg stated that this method was discussed in detail in the Plater's MONTHLY REVIEW of several years ago.

In the purification of nickel solutions for small amounts of foreign metals several methods can be used. One is plating out of the impurity and the other is by precipitating the impurity out.

In the method of plating out impurities in a nickel solution a piece of recessed work is placed in the solution and plated with the ordinary current density. The piece is then removed to see whether the high or low current density areas show any streaking or discoloration. If the high current density areas are discolored the solution is electrolized at a high current density with dummy cathodes. If the low current density areas show discoloration, the solution is electrolyzed at a low current density until the impurities are removed.

The majority of the metallic impurities plate out at low current density, but it has been found that copper and lead plate out best at less than two amperes per square foot at a pH of 2. Iron and zinc plate out most rapidly at less than 5 amperes per square foot. 200 ampere hours of plating for each 100 gallons of sclution is usually sufficient to remove all amounts of metallic impurities at a pH of 2.

The precipitation method of removing small amounts of metallic impurities consists of adding very finely powdered pure nickel to the solution and agitating the nickel solution. The nickel in dissolving will precipitate out any lead or copper present.

The worst metallic impurity for any nickel solution is chromic acid and Dr. Weisberg suggested several methods for removing this. One was the electrolyzing of the nickel solution at a pH of 2 with a very high current density. At this pH no Nickel will deposit and the solution will gas heavily.

Dr. Weisberg stated that in his experience chromic acid is often reduced to trivalent chromium in a nickel solution before the presence of the chromic acid has been noticed and that the trivalent chromium causes just as much trouble through peeling as does chromic acid.

The procedure for taking care of this trivalent chromium is to electrolyze the solution with lead anodes, which will oxidize the trivalent chromium to hexavalent chromium and then add an excess of lead carbonate, which will precipitate all the chromium as lead chromate. The solution should be filtered then and the excess of lead removed either with finely ground nickel metal or by using Liscomb's purification method.

Dr. Weisberg stated that a certain concern developed peeling in a very large Nickel Solution. They were overloaded with work and could not afford to tie up the solution. Analysis showed that the trouble was due to lead contamination. The chemist started on the job, analyzing the solution to determine the extent of Lead contamination per gallon of solution. He then calculated the amount of Chromic Acid necessary to convert the Lead into Lead Chromate. Then he proceeded to add the correct amount of Chromic Acid to the Nickel Solution. The results were that the Lead Chromate precipitated out and the solution was operated the following day for production with very good results. Dr. Weisberg stated that this method would be suicide to anyone who attempted it and made just one mistake on the analysis.

CONVENTION EXHIBITS

Mr. Roy S. Stout, Chairman of the Exhibits Committee for the International Convention of the American Electroplaters' Society to be held in Asbury Park, N. J., June 19th-22nd inclusive, 1939, reports that the exhibits committee is gratified at the number of booth space reservations which have been made to date. The Hanson-Van Winkle-Munning Co. of Matawan, N. J. lead the group with reservations for a four booth bloc. They are planning a large exhibit which should prove of special interest. Other manufacturers taking part in the exhibit are:

Maas and Waldstein Co.
The Egyptian Lacquer Co.
G. S. Blakeslee and Co.
General Ceramics Co.
Lea Mfg. Co.
Oakite Products, Inc.
Frederick B. Stevens, Inc.
Belke Mfg. Co.
Industrial Pipe and Filter Mfg. Co.

In addition, there are several contracts pending.

Mr. Stout further reports that there are still a number of booth spaces available and urges that those interested in securing reservations get in touch with him immediately.

SPRINGFIELD BRANCH

The regular monthly meeting of the Springfield Branch A.E.S., was held at the Charles Hotel on December 19, 1938, at 8 p.m.

The minutes of the previous meeting were read and approved. Applications of Mr. Robert Randall, active member, and Mr. Edmund Sperry, active member, were read and accepted.

The president then introduced the speaker of the evening, Mr. Nathan Promisel, Electrochemist of the International Silver Company Meriden, Conn. His subject was entitled "The Value of the Microscope to the Electroplater". Mr. Promisel explained the preparation of samples for plate thickness determinations, and crystal structure examinations, and the technique required to interpret the results. In preparing the specimens for thickness determination, it is first copper plated then mounted with a plastic or wood alloy, or clamped between two pieces of fibre. The sample is then polished. An etch is not required if the deposit examined is of a different color than the adjoining metal. The talk was very clearly illustrated by slides of photomicographs and curves.

An interesting discussion followed the presentation of the paper, and Mr. Promisel answered the following questions:

Q. How does the final silver solution used to build up the thickness differ from the second solution used?

A. The solution contains a lower free cyanide content. It is agitated and a high current density used.

Q. Do you use the potassium nitrate bath? Why?

A. Because we are obtaining excellent results with our present method, and see no advantage in changing.

Q. What will cause a silver deposit on the inside of a steel tank?

A. Many things may cause such a condition, short circuit. The presence of chlorides, and even agitation or stratification. Stratification may cause silver to be deposited on the inside of the tank, at definite levels because of the difference in resistivity of the concentrated and depleted solution of these levels.

The talk was both interesting and instructive and the applause which followed showed the keen interest of every member present. Mr. Promisel was given a rising vote of thanks.

The meeting was adjourned at 10:15 p.m.

D. S. HARTSHORN, JR., *Sec.-Treas.*

WATERBURY BRANCH

At our Jan. 13th, 1939 meeting Mr. Helbig of the Darco Corporation gave a talk before thirty members and guests on the Use of Activated Carbon for the Purification of Plating Solutions. He told of the effects obtained and showed where the use of this material is very important in the purification of bright nickel solutions. He showed samples of materials plated in bright nickel solutions which are dull before filtering through Activated Carbon and bright after filtering through Activated Carbon. He also showed samples of work which peeled badly when formed after being plated in a contaminated

STORTS "MAXIMUM VALUE"

TANKS

WITH OR WITHOUT LININGS
MADE FROM

ARMCO INGOT IRON PLATE
NICKEL CLAD STEEL
STAINLESS STEEL
EVERDUR METAL
MONEL METAL
ALUMINUM

●

TANKS AND LININGS OF RUBBER, CHEMICAL - LEAD, ANTIMONY-LEAD, TIN-LEAD, TELLURIUM-LEAD AND STEBBIN'S CERAMIC AND CARBON BRICK

●

PROMPT SHIPMENTS
24 Hours Service on Armco Tanks

●

COILS IN ALL METALS
Exhaust Casings — Extractors, Chrome Plating Anodes and Hooks. Other Welded Fabrication

TELEGRAPH AND TELEPHONE ORDERS PROMPTLY SERVICED

STORTS WELDING COMPANY

42 STONE STREET - MERIDEN, CONNECTICUT - TELEPHONE 1991

MANUFACTURERS OF WELDED FABRICATIONS TO SPECIFICATIONS

Please mention THE MONTHLY REVIEW *when writing*

plating solution and the same part which had proper adhesion and ductility of deposit when plated in a solution after being purified through Activated Carbon. He was able to demonstrate where the use of these materials is becoming very important in the maintenance and operation of plating solutions.

One application for membership was received from Mr. Warren Jaquiery.

The next meeting will be held Wednesday, February 8th. At that time we expect to have the Supreme President, Mr. William Phillips, with us. E. T. CANDEE, *Sec.*

CINCINNATI BRANCH

The regular meeting of the Cincinnati Branch was held at the Metropole Hotel on Thursday, Jan. 19th, instead of Jan. 26th, or one week in advance, to accommodate Mr. J. E. Weiland, of the Udylite Co., who gave a very interesting talk on procedure employed in the deposition of Bright Nickel. Mr. Weiland compared the Bright Nickel and Gray Nickel processes, and gave a very able and practical talk to the 15 members and a number of guests which was followed by quite a discussion, and a rising vote of thanks to the speaker.

The regular routine of business was conducted previous to the talk.

Several prospects for membership were in the audience, and one application for membership received.

At our February meeting on the 23rd, there will be a speaker from the Carnegie Steel Co., who will give an illustrated talk on steels used in the industry, and what relation the quality of steel plays in the ratio of costs of the finished article.

Plated samples in both bright and gray nickel on identical pieces will be displayed. J. ADLER, *Sec.*

Questions and Answers of Jan. 6th Meeting of Detroit Branch

Q. Is mercury necessary to produce a clean grey zinc plate free from stains?

A. A small amount of mercury is helpful in improving the appearance and distribution of the deposit. Excessive quantities cause trouble at the anode.

Q. What is the relative ductility of the various bright nickels as compared with ordinary hot nickel?

A. In either case the ductility is good only in the absence of impurities or colloidal suspensions in the bath.

Q. What is the recommended current density on generator brushes?

A. Per square inch of brush area 90 to 100 amperes.

Q. What is a good electrolytic strip solution for stripping copper from die castings without excessive injury to the basic metal?

A. A buffered alkaline solution containing cyanide and using oscillating current, reversing at periods of approximately six seconds.

Q. What is the reason for bagging 99% cast carbon nickel anodes?

A. Any agitation in the bath may dislodge particles of the carbon diaphragm.

Q. What is the best pH to carry in a Rochelle copper solution for plating (1) *die castings; and* (2) *steel?*

A. Die cast 12.3; steel 12.0.

Q. What is the best method of pickling bolts made of hot rolled steel?

A. Hot 10% sulphuric acid with inhibitor.

Q. Is bright nickel used on cutlery when grinding and sharpening is done after plating?

A. Not considered practical at this time.

B. F. LEWIS, *Librarian*
T. C. EICHSTAEDT, *Sec.-Treas.*

BRIDGEPORT BRANCH

The monthly meeting of the Bridgeport Branch was held in the Chamber of Commerce rooms at the Stratfield Hotel on Thursday evening, Jan. 5, There were twenty members present including the Supreme Secretary, Mr. William Kennedy. In the absence of Joseph Sterling, due to illness, Mr. William Ehrencrona, Vice President, presided.

The roll call of officers was read and in addition to Joseph Sterling, William Stratton was absent.

The minutes of the last meeting were read and accepted.

The sick committee reported both Mr. and Mrs. Sterling ill.

Dr. Walter Meyer, William Kennedy and Ray O'Connor made a report for the research committee.

There were no communications, applications nor balloting for members.

A report of progress and success was made for the chemistry class.

In regard to remarks by Mr. Kennedy concerning a regional meeting and a vote taken for the same at our October meeting, Dr. Walter Meyer and Ray O'Connor were appointed as a committee to work with other branches for such an affair.

Bills against the branch, none.

Friends of all of the members are welcome to the open meetings held by the Bridgeport Branch each month, prospective members are also invited, and by their interest it is hoped that they will reap benefits from the educational session. The first open meeting of the new year will be held on January 20, when Dr. Stericker of the Quartz Co. of Philadelphia, Pa., will address the members and friends on "New Aspects of Metal Cleaning".

The resignation of John Beloin was accepted.

EXPERIENCED ELECTROPLATERS
prefer
ANACONDA
Copper Anodes

. . . because their unexcelled purity assures uniform corrosion, the highest quality deposit in the shortest possible time and low scrap losses. Furnished with suspension holes drilled as desired, or tapped for end hooks.

ANACONDA

THE AMERICAN BRASS CO.
General Offices, Waterbury, Conn.
Offices and Agencies in Principal Cities

The treasurer's report was read and accepted.

Dr. Walter Meyer conducted the educational session for the meeting and with the members he discussed such subjects as "Filtering Nickel Solution". "Alkaline Solution", "Nickel Anodes and Chlorides", "Cleaning and Bagging of Anodes" to which Howard Rice and Ray O'Connor lent much helpful information. Thanks again to Dr. Meyer for his untiring interest in our educational session.

A motion made and seconded to adjourn.

WILLIAM H. FLAHERTY, *Sec.-Treas.*

BUFFALO BRANCH

The meeting night of Buffalo Branch has been changed from the 3rd Monday to the 3rd Friday at Stratford Arms Hotel, meetings to start at 8 p.m.

The meeting night was changed due to our out-of-town members being unable to attend the first part of the week. Here's hoping we get a large turnout from our out-of-town friends.

Mr. Ruff announced that everything was arranged for our chemistry class to start the 2nd week in January and thereafter on the 1st, 2nd and 4th Wednesday of each month at Canisius College from 7 to 9 with Mr. Harvey Slatin as chemistry teacher.

A surprise visitor of the evening was Mr. Bert Sage, formerly of Boston, who has recently come to Western New York. Buffalo welcomes you Bert and the best of luck from the boys of the Niagara frontier.

As this meeting was very close to the holiday season, all the members present adjourned to the grill room where a very delightful luncheon and refreshments were served.

Meeting adjourned at 11 p.m.

The regular monthly meeting of the Buffalo Branch was held Monday, Dec. 19th, 1938 at Geo. K. Mantz's, corner Cherry and Spruce St., Buffalo, N. Y.

Meeting called to order by our President, Mr. Joseph Ruff at 8:15 p.m.

The minutes of previous meeting were read and approved.

A communication from Mr. Ripley, chairman of the membership committee was read. Stating that he would like to resign due to business pressure.

Mr. Ruff asked that the resignation be accepted and a letter of thanks sent Mr. Ripley for his fine work as chairman of the membership committee.

Mr. C. J. Wernlund of the R. & H. Chemical Co. division of E. I. DuPont De Nemours, electroplating division, was elected to the board of managers.

WM. HART, *Sec.*

NEW HAVEN BRANCH

A business meeting of the New Haven Branch was held Thursday evening, Jan. 26 at the Sterling Chemistry Laboratory of Yale University. There were 40 members present.

The meeting got underway at 8:10 p.m. with President Joseph Downes in the chair. Bills against the branch were read and voted paid. A long drawn out discussion regarding action on the proposal of the National Research Committee, that the New Haven Branch conduct a research on the stripping of nickel deposits, followed. A motion was finally made and passed to the effect that the secretary should communicate with the National Research Committee to obtain further information regarding the same.

A motion was made and carried that the New Haven Branch should present a paper at the National Convention in Asbury Park. Pres. J. Downes appointed the following committee to take care of the preparation of this paper. Dr. H. Kellner, chairman, Tom Chamberlain and John Oberender.

The following were elected members: Armand William Faucher, active, Underwood Elliot Fisher, 118 Levesque Ave., W. Hartford, Conn.; Edgar Walter Luther, active, Underwood Elliot Fisher, 121 Washington St., Hartford, Conn.

The following member was dropped: Frank D. Daley, associate, Machinery Dealers, Inc., 419 Chapel St., New Haven, Conn.

The business meeting adjourned at 10:05 p.m.

Following the business meeting, Jack Barry presented a paper on "Recent Developments in Barrel Plating". Mr. Barry took the raw material as it is received from the press room and traced the sequence of operations, burnishing, rolling, etc., cleaning and plating, to

the finished product. This proved to be a most interesting and enlightening talk. Members present agreed that this lecture should set a precedent for the preparation of talks by other members of the Branch.

JOSEPH T. SULLIVAN, *Sec.-Treas.*

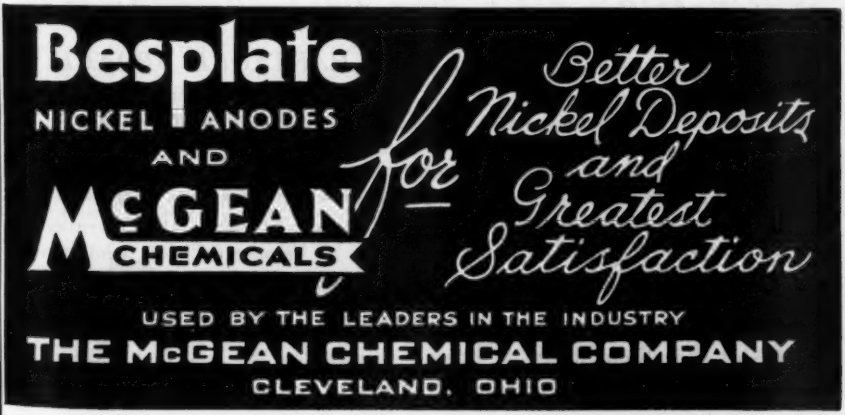
TORONTO BRANCH

Jan. 23, King Edward Hotel. President Acheson in the chair opened the 1939 meeting with 32 members and their friends who were interested in electroplating, with a grand total of 67. The president welcomed the guests and introduced Mr. Frank Griggs of the Hanson-Van Winkle Co., and Mr. Bert Gribble, of the Hiram Walker Co., who were the speakers of the evening.

After the usual routine of business, the application of Mr. P. McGuire was balloted on, and his name added to the roll. Letters were read from Mr. George Hogaboom and Mr. W. J. R. Kennedy, the first requesting papers written by the platers to be read at the next convention and the latter asking information of the Branch activities. These letters are appreciated and will be given due consideration.

Mr. Griggs was then called and gave a 45 minute talk on new and unusual developments in the field of vapor degreasing. Passing around 30 photographic drawings on different shapes and designs of degreasers, and using the blackboard to illustrate the new ideas of economy with the solvent; showing baskets for small cupped articles being turned over on the conveyor as they leave the hot chamber; emphasizing trichloretheline as the solvent to use for best results; and not to discard the oil when cleaning out the solvent chambers as it can be used for various purposes such as pipe threading, etc. Mr. Griggs talk was excellent with the members showing appreciation.

Next on the list was Mr. Bert Gribble with a talk on distillation using grain and barley as the example together with moving and talking pictures. The theme being "Nature's Course", showing the unhealthy and scrub-microbes trying to blast their way into anything that was clean and under fermentation. It was the first time the members had ever seen microbes with horns and tails and using dynamite. The most important parts of the picture were the elaborate laboratories full of every kind of testing devices known to man. The pictures were clear and the talking very



distinct, which pleased the members who gave Mr. Gribble a hearty vote of thanks. The annual Euchre and Luncheon Committee, composed of Tom O'Keefe, Jim Graham and Charlie Kemish was given power to make all arrangements for this annual affair.

Meeting adjourned 11:45 p.m.

JAMES S. CAIRNS, *Rev. Cor.*

NEWARK BRANCH

The regular meeting of the Newark Branch, A.E.S. was held on Friday evening, January 6, 1939, at the club room of the Hotel Douglas. The meeting was called to order at 8:30 p.m. with President John Kotches presiding, all other officers also present.

The minutes of the previous meeting were read and approved.

An application for Mr. William G. Borner to associate membership was voted to take the regular course.

Mr. Horace Smith, chairman of the Convention committee, appealed to all the members to have their wives run a bingo or a card party or a small raffle where they could realize about $5.00 or $10.00 and donate the proceeds to the Ladies' committee. He emphasized the fact that this was everybody's convention, not only the committee's and that he expected each member to do his share.

Our Librarian, Mr. Paul Oldam, presented as guest speaker for the evening, Mr. George Hogaboom, of the Hanson-Van Winkle-Munning Co., who gave us a wonderful talk on "Production of Special Finishes". Mr. Hogaboom exhibited sample boards which contained practically all the finishes that were ever produced in the plating industry. They represented a collection of over 25 years of plating experience by some of the best known platers in the country. Mr. Hogaboom also showed us a book containing all the formulas for all the finishes that he had exhibited which was close to 1,000. He left this book on the table for any of the members who would desire to copy some of the formulas after the meeting.

4A
Stainless Steel Polishing Compounds Of Quality
NEW NUMBERS
Ask for No. 5016 cut and color, and No. 5020 color.
4A CEMENT — a substitute for glue.
WHY NOT GET YOUR SAMPLES NOW?
HARRISON & CO.
HAVERHILL, MASS.

Mr. Hogaboom was given a rising vote of thanks by the 47 members who attended. Meeting adjourned 11 p.m.

GEORGE WAGNER, *Sec.*

HARTFORD BRANCH

The Hartford Branch of the A.E.S. held its regular monthly meeting on Monday evening, January 16, 1939, at the State Trade School, 161 So. Main St., New Britain, Conn.

The meeting was called to order at 8:15 by President Pietro, who gave a few words of welcome and then introduced Mr. W. J. R. Kennedy, Executive Secretary, who spoke a few words in regard to the aims and purposes of the A.E.S.

Mr. Kennedy then introduced Mr. Jos. Downes, Supreme Third Vice-President, who has charge of the plated exhibit at the National Convention, to be held at Asbury Park, N. J., this June 19–22.

Mr. Downes gave a short talk relative to the exhibit and asked all platers for their full co-operation, so as to make the exhibit the finest in A.E.S. history.

The meeting was then turned over to Mr. Geo. B. Hogaboom, Past Supreme President of the A.E.S., who spoke a few words of welcome and then introduced Mr. Fred Fulforth, Supreme Second Vice-President, and also supt. of finishes, at the Proctor Electric Co. of Philadelphia, Pa.

Mr. Fulforth proceeded to give one of the finest talks heard for a long time by the Hartford Branch, on "Constructive Pre-plating Methods". He passed samples as well as pictures to illustrate his talk. He talked for over an hour, and the discussion which followed also lasted for another hour. In conclusion he was given a rising vote of thanks.

The meeting was attended by eighty members and visitors, and was adjourned at 10:30 p.m.

V. E. GRANT, *Sec.*

GRAND RAPIDS BRANCH

The Grand Rapids Branch of the A.E.S. held it's first meeting on Jan. 12th in it's new location, the Spanish Room of the Rowe Hotel. Due to some of the members having to leave early, the meeting was first turned over to Mr. D. E. Willard who, with Mr. G. W. Walter and Mr. L. C. Kroes of the Detroit Rex Products Co. gave a very good talk and demonstration on degreasing. Mr. Walter gave a very interesting lecture with his excellent color movie showing various degreasers in operation. Mr. Willard showed that he "knows his stuff" on degreasers and the demonstration by Mr. Kroes cleared up a lot of points for the members. All in all the lecture was put on in true professional fashion and was certainly the type that other talks could be patterned after by those appearing before our branches. The members all appreciated the demonstration.

The following new members were elected:—Jack Holwerda, John Morse, Clyde C. Craven, H. Castle.

Correspondence regarding the exhibits at the coming International Convention was read but action was deferred till next meeting.

Cut Cleaning Time 33% — No Water Breaks

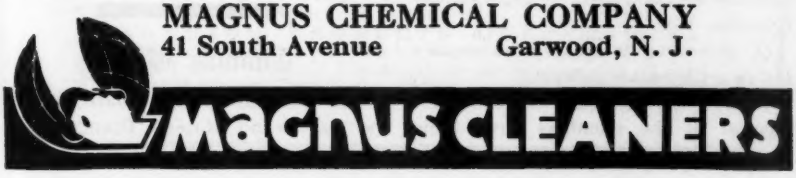
THE PROBLEM — To thoroughly clean continuous strip steel in 90 seconds or less — without leaving telltale oil and water breaks.

THE ANSWER — The strip steel cleaned in a solution of MAGNUS 94-R . . . which completely eliminated all foreign matter and water breaks within 60 seconds.

MAGNUS 94-R is an entirely mineral cleaner having a slight sudsing action. This action is due to the Cleaners colloidal properties and unusually low surface tension which give it greater cleaning effectiveness.

There are MAGNUS CLEANERS to eliminate water breaks, time loss, and rejects from your cleaning problems. Ask to have our service representative demonstrate under your own working conditions. Or, send us the details of your operations for our specific recommendations.

MAGNUS CHEMICAL COMPANY
41 South Avenue Garwood, N. J.



The following were found in the Question Box:

Q. Does bright copper pay on steel even tho it is to be colored anyway?

A. One member reports that on steel with no previous preparation the coloring is cut 10 to 15% by using bright copper. Of course larger savings will be realized on other classes of work.

Q. Are double nickel salts of any value in nickel solutions?

A. Double nickel salts, due to their low solubility (and possibly the ammonium ion), cannot be used in bright nickel or hot nickel as used today. Some platers claim that double nickel salts must be used in black nickel solutions.

Q. I have not been able to successfully replate chromium. Is it practical?

A. This turned out to be a very interesting subject. Replating chromium is carried out successfully by some of the members by merely racking up the cut thru or not covered work, putting it into the chromium bath, and applying the current very slowly. A voltage too low to deposit chromium is first applied and then increased slowly (over a period of about 1 min.) to the plating voltage which will be slightly lower than the voltage originally used to do the job. Some members complained of a visible line of demarcation with this method. It was brought out that the nickel surface will not become very passive and will receive a good chromium deposit for refinishing if the old chromium is stripped anodically in a hot alkaline solution of Soda Ash, 5 oz., Sodium Cyanide, 1 oz.

Q. How long do lead anodes usually last in a Chromium solution?

A. This is a hard question to answer. Several of the members gave their views. The lead anodes (most people use 6% antimonial lead) last at least twice as long in the sulfate chromium solution as in the hydrofluosilisic acid chrome bath. The coating formed on the anodes in the sulfate bath is not very heavy and is soft and yellowish in color—probably lead chromate. The coating formed from the hydrofluosilisic bath is dark brown and becomes very hard and scaly, some of it dropping off to the bottom of the tank if the anodes are not cleaned at least every 3 or 4 months. This coating is said to be lead peroxide along with lead oxide and lead chromate.

CHAS. S. WHALLEY, *Sec.*

Used Buffs for Sale

64-68—1⅛" arbor—20 ply

Full Disc - Loose - or Sewed

Thousands of every size

8"—8¢ each 9"—9¢ each

10"—12¢ each

MICHIGAN BUFF CO., INC.

4054 Beaufait Ave. Detroit, Mich.

Thomas Oates

Mr. Thomas Oates, a Charter Member of Grand Rapids Branch, who resigned a short time ago died in De-

troit, Wednesday, Jan. 25, at the age of 75.

Mr. Oates was born in England.

They settled in Connecticut and later went to Chicago, Ill. In 1900 he received a call from the Grand Rapids Brass Co. He remained with that firm about 20 years.

His next position was with a unit of the American Can Co., which later became the Allen Calculators, Inc., Grand Rapids, Mich.

LOS ANGELES BRANCH

The Los Angeles Branch of the American Electroplaters' Society held their regular monthly meeting on Wednesday, January 11, 1939, at the Rosslyn Hotel in downtown Los Angeles.

President Earl Coffin called the meeting to order at 8 p.m. Minutes and financial report of the previous meeting were read and accepted.

Mr. A. B. Vasquez obtained some very fine educational motion pictures from the Board of Education Film Library, which were received enthusiastically.

Mr. Joseph F. Hart's application for associate membership was read and turned over to the Board of Managers.

The following questions were found in the Question Box:

Q. In gold plating die cast hinges, what underlying coating should be used?

A. Copper should prove satisfactory.

Q. In a cyanide copper strike should the anode be hung on the steel tank making the tank partly anode?

A. The recommended procedure—use large percentage of steel anode area, small copper anode area.

Meeting adjourned at 11 p. m.

RAYMOND SOLIVAN, *Sec.-Treas.*

PROVIDENCE-ATTLEBORO BRANCH

The regular meeting was held at the Narragansett Hotel, Monday, Jan. 16, 1939. Mr. Wm. F. Cahill was the speaker, and his topic was "Alkaline Cleaners". The speaker was presented by the Vice-President, Mr. Bernard Ganley. On being provided with a large size blackboard, "Bill" proceeded to give us a regular chalk-talk.

Classifying the various forms of oils and greases that may be met with, as Saponifiable and Non-saponifiable, he listed the many phases of cleaning problems, describing the functions of the different components and bringing

PERMAG
CLEANING COMPOUNDS

If you haven't used PERMAG, try it for 1939. Note the efficiency — quick action — low cost — labor saving. Magnuson Research Service helps solve your metal cleaning problems. Ask us about it.

MAGNUSON PRODUCTS CORPORATION
Main Office and Factory, Third & Hoyt Sts., Brooklyn, N. Y.
Specialized Scientific Cleaning Compounds for the Electroplating Industry.
Warehouses in Principal Cities, U. S. Canada: Canadian PERMAG Products Ltd. Montreal, Toronto.

out that there are new chemicals being brought into the cleaner make-up, indicating that the picture is continually changing.

There was a lively discussion following the talk, also Mr. Mark Weisberg gave a short chalk-talk, explaining the properties and chemical hook-ups of the newest additions to the cleaner make-up.

It was voted that the librarian should invite Mr. Bucy of the Zapon Co., to talk to us on "Lacquers" at the next meeting.

There were 16 present.

JOHN ANDREWS, *Sec.*

CHICAGO BRANCH

The regular monthly meeting of the Chicago Branch was held Jan. 14, 1939 at the Atlantic Hotel.

Vice President G. Holmgren presiding in the absence of President J. W. Hanlon and Mr. O. E. Servis acting as Librarian in the absence of our Librarian O. Weickmann, all other officers present.

Mr. H. A. Gilbertson reported that the banquet was ready and waiting.

Communications from Mr. W. J. R. Kennedy and Mr. F. Fulforth requesting various methods used to place educational matter before the members, read and a committee of Mr. F. J. Hanlon, Mr. O. E. Servis, Mr. H. A. Gilbertson and Mr. C. Kocour was appointed to forward this information.

Mr. O. E. Servis, acting librarian, found the following questions in the Question Box:

Q. What is a good bright dip for brass that is to be lacquered?

A. Sulphuric acid 2 parts, nitric acid 1 part, muriatic acid a few drops, water 1 pint to 5 gallons of bright dip.

Q. Is it satisfactory to use hydrogen-peroxide to stop pitting in a die cast nickel plating solution?

A. Yes.

Q. Which would you suggest for chrome plating for decorative purposes, a ratio of 85 to 1 or over 100 to 1?

A. Over 100 to 1.

M. H. LONGFIELD, *Sec.-Treas.*

Wanted

HIGH PRICE PAID
for your
Worn Out Buffs

Submit Sample

MICHIGAN BUFF CO., INC.
4054 Beaufait Ave. Detroit, Mich.

CLEVELAND BRANCH

The regular monthly meeting of the Cleveland Branch of the A.E.S. was held at Hotel Cleveland, Sat. Jan. 7, 1939.

Meeting called to order by our President, Mr. Matts.

Minutes were approved as read and also the minutes of the December meeting.

Received applications of Mr. John Medise of the Ohio Plating, active membership; Mr. O'Patrny of the F. B. Stevens Co. associate member; Mr.

John S. Yingling of J. B. Ford Co., resigned associate member.

Mr. Ross Lyons of the Hanson-Van Winkle-Munning Co., and also a member of the Cleveland Branch gave a very good talk on "Copper Oxide Rectifiers". Mr. Lyons was given a rising vote of thanks.

The Cleveland Branch thanks the Hanson-Van Winkle-Munning Co.

The "Dinner Dance" will be held in the Empire room of Hotel Cleveland, Sat. Feb. 11, 1939.

Meeting adjourned at 10:30 o'clock.

The regular monthly meeting of the Cleveland Branch of the A.E.S. was held at Hotel Cleveland, Saturday, Dec. 3, 1938.

Meeting called to order by our President, Mr. Matts.

There were no minutes read due to a fire at secretary's home.

Mr. Wm. O'Berg filled in for secretary.

Mr. Truden, our Librarian, introduced Mr. Blackman of the Alum Co. of America, who spoke on "Anodic Treatment and Coloring of Alum-Aloga". Mr. Blackman was given a rising vote of thanks.

The Cleveland Branch thanks the Alum Co. of America and Mr. Blackman.

Letter of thanks from Mr. Peterjohn was read.

Meeting adjourned at 10:30 o'clock.

CHARLES F. OTT, *Sec.-Treas.*

MILWAUKEE BRANCH

The 295th regular meeting of the Milwaukee Branch A.E.S. was held at the Republican Hotel on Thursday, February 2nd. The meeting was called to order promptly at 8 p.m. by President Dexter Rhodes, with all officers present.

pH PAPERS

FOR DETERMINING pH VALUES OF SOLUTIONS

ACCURATE RESULTS IN FEW SECONDS

Just dip strip of pH paper in solution and read off pH value. Can be carried in pocket. Always handy.

AVAILABLE RANGES

Acid:	*Alkaline:*
pH 5.2—6.7 (nickel)	pH 6.6— 8.1
3.6—5.0 (nickel)	8.2— 9.7
3.7—5.3 (zinc)	9.2—11.0
1.9—3.4 (copper, nickel)	(brass, copper,
0.9—1.5 (copper, etc.)	silver)
	11.0—13.5 (Cadmium, zinc, tin and cleaners)

Each Range is Separately Boxed.

PAUL FRANK

Canada: Jaquays; Starke & Co., Montreal

Minutes of the previous meeting were read and approved. All communications were also read and placed on file and all bills were paid.

The chairman appointed Mr. Wm. C. Geissman as chairman of a committee to arrange a paper for the Milwaukee Branch to be presented at the 1939 Convention.

Jack Geissman, chairman of the April banquet committee, reports that the date of the Milwaukee banquet has been changed to April 29th. This change has been made in order to engage the famous Heinie and his Grenadiers. We feel that the best is none too good for our guests and that Milwaukee Branch is going to prepare an even better time than the one held at the Convention. So if you were at the Convention, you already know what a good orchestra Heinie has. If you were not there, ask someone who was, and after

they tell you I am sure you will want to mark April 29th as your next date to meet with the Milwaukee Branch.

Mr. H. I. Hansen of Du Pont was the guest speaker of the evening. His subject was "Copper Plating from Cyanide Solutions."

This talk was very interesting and instructive as well. Questions were asked by members and Mr. Hansen did very well in answering all. We thank Mr. Hansen.

There were 51 members and guests present at this meeting, which adjourned at 10:15 p.m., followed by refreshments for which Milwaukee is famous.

ROBERT B. GOODSELL, *Sec.-Treas.*

PHILADELPHIA BRANCH

Meeting called to order by Vice Pres. Fred Fulforth, presiding, Pres. Joe. E. Underwood being absent on account of sickness.

Communication from Mr. Hogaboom chairman Educational Meeting, International Convention, laid over until next meeting. Communications from 3rd Vice Pres. J. L. Downes and Research Chairman Mr. Hogaboom laid over until next meeting.

Mr. Hunt gave an interesting lecture with slides on the problems of wetting agents as to bright nickle deposition; a very interesting discussion was entered into with the assistance of Mr. D. Robson as to the difference of oil. This proved very interesting, as Mr. D. Robson knows how to give an intelligent explanation of the discussions as they arise. We should hear more often from Mr. Robson. At the conclusion of Mr. Hunt's lecture moved and seconded Mr. Hunt be given a rising vote of thanks. Carried.

Application of Mr. Mathew Dudek for associate member referred to the Board of Managers. Applications of Messrs. G. Racine, Wm. H. Nuhohon, R. D. Cantanzaro, S. Cantanzaro, as active members; and A. B. Hoefer, Wm. M. Swain, G. S. Bregendahl, Arthur G. Snow, J. H. Miraski and John C. Mylin as associate members reported favorably by Board of Managers. It was moved and seconded that the applications be accepted. Reinstatement of Mr. A. Bosley accepted. Members to be dropped, Mr. Achermann, R. H. Thompson and H. T. Mansfield. Transfer of Dr. R. Wicks accepted, from Balto, Wash. Branch to Phila. Branch. Moved and seconded bills be paid. Carried.

Librarian E. J. Zurbach informed the Branch that Mr. Al Hirsch will have a good subject for Feb. 24, 1939, meeting; Dr. Walter Meyer will deliver a lecture for our March 24, 1939 meeting.

Mr. L. A. Critchfield of Hamilton Watch Co., at Lancaster, informed the members that a class has been formed in the Stevens Trade Industrial School of Electro-Plating at Lancaster City, Penna., with Mr. L. A. Critchfield as instructor. It opened Jan. 24, 1939, with a roster of 47. The course will cover basic theory in a series of lectures, and carry on later with analytical control in line with the plans of Mr. Al Hirsch in Mastbaum Vocational Training School at Phila. Will have more on this matter later.

There being no further business, meeting adjourned till Feb. 24, 1939, at Harrison Lab., U. P., 34th and Spruce Streets, Phila. Penna.

ROBERT E. JACKSON, JR., *Sec.-Treas.*

TOLEDO BRANCH

A regular meeting of the Toledo Branch of the A.E.S. was called to order by the President, Stanley Moore, at the new vocational high school laboratory, at 8:15 o'clock, p.m., Feb 2nd, with 13 members present. The min-

utes of the previous meeting were then read and approved. The treasury statement was read and approved. At this point Mr. Walter Weiker questioned a motion passed at a previous meeting pertaining to reinstatements of members who had been suspended for non-payment of dues in the past, on the ground that he believed that it conflicted with the constitution and by-laws of the society. After some discussion on the matter and reading of section 2 and 3, article 6, in the by-laws of branch societies, Mr. James Gerity who made the original motion, asked that his motion which was passed at a previous meeting, be overruled or repealed, because there was already a clause in the constitution and in the by-laws to take care of the matter. With the unanimous consent of the members, the chair ruled the motion out of order, because it was the opinion of the branch, that it conflicted with our by-laws. The secretary was then instructed to send out quarterly statements to members, as a reminder, and to act according to section 2 and 3 in the by-laws of the branches in the matter of suspensions. A motion by Mr. Gerity authorizing the secretary to purchase 1,000 envelopes for the branch was seconded and passed. Mr. Moore, Mr. Hunlock, and Mr. Miner were then appointed on a committee to do some research work in co-operation with the national research committee. Convention papers and exhibits were then discussed. It was agreed to take the matter under consideration, but definite action delayed till a later date.

The speaker for the evening, Mr. B. G. Bower of the Howel Co. of St. Charles, Ill., who was to talk on slow speed polishing and finishing of metals, was unable to be here because of the weather conditions. At this time a motion by Mr. Weiker, that the secretary get in touch with Mr. Bower to see if he could speak at our next meeting, was passed. If this failed, the secretary was instructed to try and get Mr. Carl Diltmar from the E. I. Du Pont-de Nemours Co. to come to our next meeting.

The questions found in the question box were:

Q. What is the protective value of .0005 Ni. on No. 3 finish steel?

A. Ample protection for work that is used inside.

Q. What is the best lining to use for hot Ni. sol.?

A. Rubber lining.

After this there was a lengthy discussion on how to make the meetings more interesting, and to make a new effort to get new members.

The meeting adjourned at 10:00 o'clock, p.m.

G. H. BERGEMAN, *Sec.*

NEW YORK BRANCH

The New York Branch held two scheduled meetings during the month of January, at their headquarters in the Hotel Pennsylvania.

The first meeting of Friday, January 13th, was an Educational meeting, featured by a lecture by Mr. Lionel Cinamon, Ch. E., of the Special Chemicals Corp. of New York City. His subject, "Some Reflectivity Relationships of Individual Metals to Electroplated Alloys", proved to be something different from the usual talk on plating process, inasmuch as it brought to the attention of the membership a comparatively new development in the study of metal surfaces and their reflectivity and pointed out through the use of a demonstrating apparatus the manner of determining reflectivity. Mr. Cinamon covered his subject well

and aroused the interest of his hearers. He was called upon to answer a number of questions at the close of his lecture. The Branch was honored by the presence of Dr. Walter Meyer, the new Managing Editor of the Metal Industry, who was called upon by President Liguori to address the Branch and who also was invited to act as chairman of the Educational Session. Both Mr. Cinamon and Dr. Meyer were accorded a rising vote of thanks for their efforts of the evening.

The second meeting of Friday, January 27th, was a business meeting with reading of applications and reports of committee in charge of the coming joint Banquet of the New York and Newark Branches at the Hotel Pennsylvania on February 18th. At this meeting the Branch was also honored by a visit from the National Executive Secretary, Mr. W. J. R. Kennedy of Springfield, Mass. Mr. Kennedy was introduced by President Liguori and was called upon to address the membership at the close of the business meeting. Our Executive Secretary responded with a resume of the Society's activities in the various Branches and his efforts to bolster the REVIEW and called upon the membership for co-operation in the national Society's program. At the conclusion of his remarks Mr. Kennedy was extended a rising vote of thanks for his visit and his address.

The meeting was then adjourned at 11:10 p.m.

F. J. MACSTOKER, *Sec.*

ROCHESTER BRANCH

On Friday night, Jan. 20, the Rochester Branch held its regular monthly meeting at the Seneca Hotel. The meeting was called to order by Pres. Del Rosso. All regular business was dispensed with and the meeting was turned over to vice-president Charles Hehr, who then introduced the guest speaker of the evening, Mr. LeRoy Sullivan, representative of the Divine Brothers Co., Utica, N. Y., who favored us with a talk entitled "Glue—It's Uses and Abuses—Primarily with Relation to the Heading of Polishing Wheels for Low Production Cost".

Little is generally known about glue, said Mr. Sullivan, particularly stressing the lack of cleanliness in the glue rooms. In the course of his travels he has seen hundreds of dollars lost because of uncleanliness. "Cleanliness is next to Godliness" is a maxim used in nearly all work. The platers demand as nearly a chemically clean surface as possible to obtain. He filters his solutions to keep them clean and yet the head of a polishing department gets careless when it comes to the handling

MILWAUKEE BRANCH

will hold its

ANNUAL EDUCATIONAL SESSION

and

BANQUET

SATURDAY APRIL 29th, 1939

of glue. Just enough glue should be made up for one day's use because after about seven or eight hours of standing bacteria grows in glue and cuts down its efficiency by as much as fifty per cent. The continual use of glue by just making additions is very poor business, because it loses more instead of saving it. Glue should be soaked for two or three hours in *cold* water, and then brought up to about one hundred and thirty degrees F. It should never be boiled. The best glue to use for polishing wheels is the best grade A hide glue which is very rubbery and either dark brown or amber in color. Mr. Sullivan went on to tell about handling wheels and glue to get best results but all the way thru he stressed the one point very highly—Cleanliness.

After the conclusion of the talk, Mr. Sullivan consented to answer any questions.

Mr. Moore: *How do you determine strength of glue?*

Mr. Sullivan: The laboratory determines this but most of that type of data comes from the Bureau of Standards.

Mr. Moore: *Is bacteria in glue always the cause of trouble?*

Mr. Sullivan: Not always, but bacteria does begin to form after about four hours and reduces the strength of the glue.

Mr. Hehr: *How can you prevent the breaking off of felt wheels?*

Sully: Clean wheel with carborundum brick cut down. Be sure there is no grease on wheel. To make absolutely sure sandpaper the wheel. Size, dry 24 hours, glue then roll, putting on as many heads as desired, allowing one hour between each head. After final head, leave dry for not less than 48 hours.

There were innumerable other questions which Sully answered after which he was given a rising vote of thanks for and interesting and educational talk and invited to come again soon. The meeting was then adjourned.

JUDSON R. ELSTER, *Sec.*

BRIDGEPORT BRANCH

The regular monthly meeting of the Bridgeport Branch was held on Thursday, Feb. 2, in the Chamber of Commerce Rooms at the Stratfield Hotel. The meeting was called to order by the President, Joseph Sterling. The roll call of officers was read, Herman Braun and John Schneider were absent. The minutes of the last regular meeting were read and accepted.

Reports of special committees: Mr. Ray O'Connor and Dr. Walter Meyer reported on the joint Banquet and Educational Session to be held in Hartford, Conn., at the Hotel Bond on April 15 with the Hartford, New Haven, Springfield, Waterbury and Bridgeport Branches taking part. The Educational Committee has procured some very fine speakers, the names of whom will be given at a later date.

Mr. Eugene Phillips talked concerning exhibits for the coming Convention. The committee for these exhibits consists of Mr. Joseph Sterling, chairman, Eugene Phillips, Edward Charleson, George Wagstaff, and Ray O'Connor.

A communication was read from Mr. Hogaboom in regard to papers to be read at the Convention. All papers will be sent to Mr. Hogaboom that have been prepared by members for this occasion.

The Bridgeport Branch will be represented at the joint Banquet and Educational Session held by the Newark and New York Branches on Feb 19, in response to an invitation from Mr. F. J. McStocker.

A communication from Mr. Joseph

Downs on exhibits was read and it was voted to take this matter up at the March meeting.

The following applications for membership were received and turned over to the Board of Managers: Americo Fred Rivelli, General Electric Co.; Dionigi Ferhener, General Electric Co.; and Willoughby G. Sheane, General Electric Co.

All bills against the Branch were ordered paid.

Good of the Order: The members were urged to be more faithful in their attendance to the regular meeting and the open meetings, and to feel free to bring any friends or members from other branches who might be interested. The chairman of membership suggested that at least one member try to bring an applicant to each meeting in order to try to swell the membership. The Educational Session was conducted by Dr. Meyer, after which the meeting adjourned.

The next Educational Session will be held in the Breakfast Room of the Stratfield Hotel on Friday, Feb. 17. Mr. Ralph McCahan of the Electro-Plating Division of the E. I. Du Pont de Nemours Co., R. and H. Division will be the guest speaker. The Technical Chairman for the affair is Dr. Walter Meyer, Managing Editor of the *Metal Industry*.

WILLIAM H. FLAHERTY, *Sec.*

DETROIT BRANCH

Meeting of Feb. 3rd called to order by our President, Mr. James W. Higgins, at 8:20 p.m. All the officers and a hundred and thirty-five members being present.

Minutes of the previous meeting read and approved.

A letter from the joint committee of

ALL WELCOME TO BOSTON MARCH 4, 1939

Boston Branch Will Hold Its Annual Banquet

SATURDAY, MARCH 4, 1939

BRADFORD HOTEL, BOSTON at 2 P. M.

Educational Session in the Afternoon and Entertainment for the Ladies

Floor Show, Banquet and Dancing in the Evening

SUBSCRIPTIONS $2.50

the New York-Newark Branches for their first joint session to be held at the Pennsylvania Hotel, New York City, Saturday, Feb. 18, 1939.

There were five new members elected to membership.

Mr. Wilson White, active member, was transferred to the Anderson Branch. Mr. M. B. Harris, active member, was reinstated to membership. Mr. Thomas Kulzak, active member, was suspended for non-payment of dues.

There were ten applications for membership, these were referred to the Board of Managers and will be acted upon at our next regular meeting March third.

Mr. Carl Heussner, chairman of the New Membership Committee, then addressed the meeting making several appointments for special work during the next month to assist in bringing up the new membership to our quota, which he expects will be filled by our next meeting.

Our President, Mr. Higgins, then expressed his appreciation of the work which Mr. H. M. Cherry, as chairman of the Second Annual Educational Session Dinner and Dance did and thanked him for the services he so willingly rendered.

The president then introduced Mr. Floyd F. Oplinger, E. I. Du Pont de Nemours and Co. Subject: "High Speed Copper Plating". Mr. Oplinger gave a very interesting paper on this subject and spoke very convincingly. The illustrations on slides were records of the different results obtained in their experimenting. A full description of his paper will be published in our next copy of the REVIEW. There were numerous questions asked and these questions brought out quite a bit of discussion and I feel sure that all those present were amply compensated for being present.

Our President, Mr. J. W. Higgins, expressed to Mr. Oplinger his appreciation and thanks of the Detroit Branch for his being present and giving us this paper. Mr. Oplinger was also applauded by the meeting.

Mr. B. F. Lewis, our Librarian, being absent, Dr. Richard B. Saltsonstall was asked to take charge of the Question Box. There were quite a number of interesting questions and they were discussed and answered. Mr. Saltonstall handled this part of the meeting very efficiently.

Meeting adjourned at 10:20 p.m.

THEODOR C. EICHSTAEDT, *Sec.-Treas.*

ANDERSON BRANCH

The Anderson Branch of the A.E.S. held their monthly dinner meeting at the local Y.M.C.A. on January 16. President L. R. Hinsch presided and all other officers were present.

Dr. M. M. Beckwith, chief chemist of the Guide Lamp Division of the General Motors Corp., spoke on the "Relation of Chemistry to Electroplating". His talk was very interesting and comprehensive and was enjoyed by all present.

A business meeting followed. Adjournment at 9:45 p.m.

E. L. MCKINNEY, *Sec.-Treas.*

The Anderson Branch of the A.E.S. held their monthly dinner meeting at the Peter Pan Inn on Feb. 6. The dinner was at 6:45 p.m. and the meeting was called to order at 7:45 p.m. by Vice-President C. F. Hauri.

Mr. R. O. Hull of the Experimental Laboratory of the Grasselli Chemical Division of the E. I. Du Pont de Nemours Company of Cleveland, Ohi o

spoke on "Plating Methods of 1939". He illustrated the vast changes and improvements that have taken place in the plating of cadmium, zinc and copper, within the last few years. He supplemented his talk with slides and had samples of various plated ware, some of which were of an extraordinary nature. He also showed the use of the stalagmometer in determining surface tension.

Mr. Hull was greeted by a larger number of members and guests than is usual for this Branch.

Meeting adjourned at 9:15 p.m.

E. L. McKINNEY, *Sec.-Treas.*

ST. LOUIS BRANCH

Regular meeting of the St. Louis Branch A.E.S. was held at the central Y.M.C.A., Friday, Feb. 3, 1939.

After partaking of a hearty meal, meeting was called to order by Mr. Ricket.

Regular order of business was suspended, the only order was the election of new members, there being five; namely: Mr. Harry G. Diller, 4827a Cote Brilliante Ave., St. Louis, Mo.; Mr. Milton Mestermacher, 3514 Colonial Ave., Normandy, Mo.; Mr. Robert V. Voelker, 435 North 26 St. East, St. Louis, Ill.; Mr. James L. Dawson, Jr., 555 E. Essex, Kirkwood, Mo.; Mr. J. Fritz, 4092 Bingham Ave., St. Louis, Mo.

They were duly elected and the meeting was turned over to J. Vogt, Librarian, who introduced Mr. Benner of Du Pont Co., who gave a talk on "High Speed Copper Plating", made comparisons between plain copper and Rochelle salts and the H. S. copper bath the cost to maintain. Explained everything clearly so that every one could understand.

He also spoke of the thickness of copper that could be put on in a short time, so short it was remarkable. Had some samples, they looked very good; every one inspected them for defects but none were found.

The type of questions that were asked are:—*What is the difference in the cost? How often do you add Brightener? In filtering do you remove the Brightener? Is the solution hard to control? Do you have to titrate for caustic before you analyze?* And many other questions.

Mr. Benner answered them all to the satisfaction of all. When he finished he was given a rising vote of thanks, which was well earned. St. Louis Branch owes Mr. Benner a debt of gratitude for bringing out one of the largest attended meetings St. Louis Branch has ever had. 61 men being present.

Some of the men in the attendance were: Mr. Marle, Harshaw Co.; Mr. Diller, Du Pont Co.; Mr. Young, Du Pont Co.

Next meeting to be held at the Knapp Monarch Co.

Only those men receiving an invitation from Knapp Monarch Co. can attend. No doubt this meeting will be another large meeting so do not fail to watch for your invitation as the Knapp Monarch Co. has your name and address.

Again thanking Mr. Benner for his talk and instructions he gave to our Branch.

CHAS. T. McGINLEY, *Sec.*

BOSTON BRANCH

Boston Branch met Thursday the 3rd at the Bradford Hotel, Boston, with President DeLorme in the chair.

Minutes of the previous meeting read and approved; communications read and placed on file; bills read and ordered paid.

A report was made by the banquet

committee as coming along fine and they say that it will be one of the best ever held by the Branch. Every member is working hard to make it a very enjoyable one for all the friends of Boston Branch. A very fine educational session has been arranged for the men. The ladies will be taken care of by the ladies' committee in the afternoon, and banquet with one of the best entertainments and dancing in the evening, so don't miss it. Everybody welcomed to Boston, Saturday, March 4th.

The exhibit committee will have one of the best exhibits ever seen at the convention in June.

Our Executive-Secretary, Wm. Kennedy, paid us a visit and he was welcomed. He spoke of his travels around the other branches; of what they are doing; on membership; and asked the members to send in papers for the REVIEW and also about what the members are doing here and there. Read the "Here and There" in your REVIEW and you will get the idea. He is also working to make our banquet a success. He also spoke of the educational session to be held sometime in April at Hartford, Conn., by all the New England branches, and invited all the members to attend. You are always welcome to Boston, Bill!

The chair was then turned over to our Librarian, Arthur Mintie. He had the speaker Edmund S. Jeveli. He read a paper on "Bright Nickel". He explained the working of the solution, and how the solution is kept clean by using the filter for the removal of oils and grease that get in the solution. He doesn't see any difference between a bright nickel solution and a hot nickel solution. What do you think? He answered all questions for the members and was giving a rising vote of thanks.

The next speaker was our Librarian Arthur Mintie. He spoke on "Copper Solutions" as an abstract from the paper by A. K. Graham, given at the Detroit Branch meeting of Nov. 4th. He and Ed. Jeveli gave the members a fine talk in explaining the anodic reactions of both acid and alkaline copper solutions. It was very interesting.

We also had another speaker that we did not expect. Mr. Kenneth P. Bellinger, of the Pennsylvania Salt Co. He gave an interesting short talk on the new cleaner now on the market known as "Orthosil". He says that this cleaner is finding a place in the trade because of its remarkable speed and effectiveness in cutting through grease and dirt. He also explained the different actions of the chemicals in this cleaner. This was the first time that he has been around Boston. He was given a rising vote of thanks for his interesting talk.

It was one of the best meetings Boston Branch has had in a long time. Seventy members and friends were present.

ANDREW W. GARRETT, *Sec.-Treas.*

LOS ANGELES ANNUAL MEETING

All welcome to Los Angeles, California, March 25th, 1939. Los Angeles Branch will hold its Annual Educational Session and Dinner Dance at the Roosevelt Hotel in Hollywood on Saturday, March 25, 1939.

We will have an interesting Educational Program with four prominent speakers upon pertinent subjects with this session starting at 1 p.m.

The Dinner and Dancing at 7 p.m. will be in an atmosphere of glamour different than you can experience anywhere else.

Price $2.50 per person. Tables reserved by number for parties of from two to ten.

Here and There

NEW YORK. It was a pleasure to greet the members of New York Branch at their regular meeting January 27. Despite the cold evening, the attendance was good. Long and interesting discussions on plating problems are an outstanding feature of these meetings. President Liguori, Secretary MacStoker, Henry Levine, Lionel Cinamon, Louis Cates and many others expressed themselves very freely on each subject presented. We missed John Rolff who was absent because of Mrs. Rolff's illness. All the members are enthusiastic regarding the New York-Newark joint meeting on February 18.

BOSTON BRANCH. Regular meeting on February 2nd was well attended despite the weather. Mr. Ed Javelli gave a good talk on bright nickel. Mr. Kenneth P. Bellinger of the Pennsylvania Salt Co. also spoke and gave us a lot of information regarding cleaners. Bill Treadwell of Maas & Waldstein Co. reported on the progress being made in connection with the annual meeting of Boston Branch, March 4. This was a fine meeting. There was a splendid feeling of good fellowship. Arthur Mintie acted as librarian. Refreshments were served at the close of the meeting.

A.E.S. BUTTONS. The A.E.S. Buttons are going like hot cakes in Branches where they have been shown.

BALTIMORE-WASHINGTON. The Baltimore-Washington Branch annual Educational session and Banquet was held in the Engineering Bldg., University of Maryland, on Saturday, Feb. 4. President Ermlich introduced Dr. Charles Kasper as Master of Ceremonies. The first speaker was Edwin C. Rinker of Oakite Products Company who spoke on Plating of Jewelry Novelties. R. H. Kittner, American Hard Rubber Co. followed, taking for his subject Application of Rubber in Plating, illustrated with lantern slides. Vice-President of the Supreme Society Fred Fulforth's address was entitled Constructive Pre-plating Methods. H. Leroy Beaver told about the Barrel Finishing of Metal Products. President of the A.E.S., W. M. Phillips showed the picture entitled "The story of a grill". All speakers were heartily applauded at the conclusion of their addresses.

The banquet at the Lord Calvert Inn was a delightful surprise. The food was exceptionally good. The surprise was the full house. Several extra tables had to be "dusted off" and placed in the dining room in order to accommodate the unexpected overflow.

President Phillips and all members of the Executive Board held a meeting at the Willard Hotel, Washington, previous to the Educational Session.

Leroy Beaver looked as though he had come from one of the battlefronts. We are glad that all escaped so well and that no bones were broken in the auto accident. Mr. Beaver gave us a fine talk in spite of his injuries.

We have our own interests in Washington and Baltimore. It is always a pleasure to shake hands with some of the old timers. Tom Slattery, past Pres., the Pierdon's, father and son, Dr. Blum, Paul Strausser, C. T. Thomas and the tireless worker, Irvin Hahn, Secretary of Baltimore-Washington Branch.

Red Wilson says he likes to come to Washington to see where his money is being spent.

Past President Horace Smith of Newark Branch, chairman of the Convention Committee was one of the visitors.

George Gehling, Past President of the A.E.S. and several other Quaker City citizens including Eugene Zurback were also present.

CHICAGO. Chicago Branch held its 27th annual Educational Session and Banquet at the Palmer House, Saturday, January 28. On account of another A.E.S. meeting we were not present. We understand it was a well conducted, interesting and largely attended event, with about 350 attending the afternoon session and approximately 800 at the banquet. Chicago is our largest Branch and has men in its membership who can do things in a big way. The speakers

4 times faster!

New DU PONT high speed COPPER Electroplating Process

This time-saving process is a money-saver. If it's production that's needed, you can get more work from the same equipment or you can use less equipment to get the same amount of work. On steel or zinc die casting, you can be sure of a speedy, uniformly bright copper deposit—free from pits and imperfections. This deposit makes a good undercoating for either dull or bright nickel plating.

Deep recesses and partially shaded areas receive better protection because of the solution's excellent throwing power. Bright nickel is more uniform, more lustrous on these heavy copper deposits. Buff, if you need to—you'll find it less expensive and quicker than polishing steel prior to nickel plating. The du Pont High Speed Copper Plating Process is easily installed in usual cyanide plating equipment.

Write today and arrange for an interesting demonstration . . . in your plant . . . of this New du Pont High Speed Rapid Plating Copper Process.

(Both the process and the constituents of the solution are the result of the famous du Pont Research, and are covered by patents applied for by the du Pont Company).

ADVANTAGES

Du Pont High Speed Rapid Plating Copper Process

- ✓ Bright, lustrous deposits on steel and die castings.
- ✓ Four times faster than present commercial practice.
- ✓ Heavier coatings possible—up to 0.03" and more.
- ✓ Buffing made easy because of soft, fine grain deposits.
- ✓ 100% efficiency at the Cathode, up to 60 A/SF.
- ✓ 100% efficiency at the Anode, up to 30-40 A/SF.
- ✓ No pitting.
- ✓ No hydrogen or noxious fumes.
- ✓ Negligible cyanide decomposition.
- ✓ No sludging or polarization of anodes.
- ✓ Simple, easy control.

DUPONT
ELECTROPLATING
CHEMICALS · PROCESSES · SERVICE

E. I. DU PONT DE NEMOURS & CO., INC.
Electroplating Division, Wilmington, Delaware
SALES OFFICES:
Chicago, Ill. Detroit, Mich. Niagara Falls, N.Y.
Cleveland, Ohio New York City El Monte, Calif.

were Messrs. W. M. Phillips, Floyd Oplinger, G. A. Stocker, and Walter Pinner.

LADIES' AUXILIARY. Meet the Ladies' Auxiliary of the A.E.S.! Newark Branch has taken the initiative in giving the ladies the privilege of forming the first women's Auxiliary of the A.E.S. This organization will continue to function long after the Asbury Park Convention has passed into history. The officers are as follows: Mrs. H. H. Smith, President; Mrs. George Wagner, Secretary; and Mrs. Nelson Sievering, Treasurer. Our best wishes are extended to this newly formed addition to the A.E.S.

MILWAUKEE. Milwaukee Annual Meeting has been changed to April 29.

WATERBURY. President W. M. Phillips visited Waterbury on Wednesday evening, Feb. 8. There was a large attendance from neighboring branches at the Waterbury Gas & Electric Light Company's auditorium. President of the local Branch, Louis Lougee, introduced Secretary Ellsworth Candee, who in turn presented Librarian Earl Couch as Librarian. The first speaker was Mr. Louis Loutrel, who gave a fine talk on Ferric Sulphate for Pickling Copper Alloys and Stainless Steels. Mr. Phillips presented the moving picture, "The Story of the Grill". Both speakers received generous applause at the close of their remarks.

DATES TO REMEMBER. Keep these dates in mind: Boston Branch annual meeting, March 4; Los Angeles Branch annual meeting, March 25; Milwaukee Branch annual meeting, April 29; Combined meeting of New England Branches at Hartford, April 15.

MR. PROCTOR ENTERTAINS VISITORS

Dear Mr. Kennedy:

I attach a clipping from "The Sun" Clearwater, Fla., denoting a visit to me here in Clearwater of two distinguished members of the A.E.S.

"Mr. and Mrs. Walter Fraine of Dayton, Ohio, and Mr. and Mrs. Oliver Sizelove of Arlington, N. J., were recent visitors in the home of Charles H. Proctor, 309 Vine Avenue. Both Mr. Fraine and Mr. Sizelove are members and officials of the American Electroplaters' Society of which Mr. Proctor is the founder."

You might mention Mr. Fraine's connection with the National Cash Register Co. and Mr. Sizelove's connection with the Frederick Gumm Chemical Co., Kearny, N. J. Mr. Sizelove's address should have been Newark, instead of Arlington.

I am always pleased to have any member of the A.E.S. pay me a visit. My door is always open to them at any time they should come to Clearwater.

A second clipping denotes I still keep in the *Front Ranks*. Hundreds of tourists sojourning in Clearwater have visited my home to see the wonderful Mountain Ebony Tree in bloom, the past week.

The Proctor Chemical Co. is doing great things here. My visitors are shown the laboratory where I do my developments. Kindest regards.

Yours truly,

CHARLES H. PROCTOR.

Mountain Ebony Is In Full Bloom

A mountain ebony tree, on the property of Charles H. Proctor, 309 Vine avenue, is now in full bloom. Mr. Proctor said yesterday, and renewed a previous invitation for anyone interested to see it.

The blooms themselves are of rich purple hue. The tree, about 20 feet in height, will be in bloom for about a week, Mr. Proctor said.

"In Central America and in Europe," Mr. Proctor said, "and all over the United States, I have never observed a flower that so nearly approaches the beautiful wild orchids of the Malay Peninsula on the journey from Singapore to Ponang."

EGYPTIAN HIGH-BAKE N. F. R.

A TOUGH mar-proof chemically resistant synthetic finish for all types of metal products. Extremely durable. Increases resistance to abrasion and other forms of wear so detrimental to ordinary finishes.

A FEW OF ITS FEATURES

- **Applied by spraying or dipping . . . No special equipment required.**
- **Wide range of baking temperatures.**
- **One coat directly on smooth metals . . . No priming coat necessary.**
- **Special undercoats for finishing rough castings . . . Undercoats which air dry for sanding, yet may be baked as a composite finish after application of Egyptian High-Bake N-F-R.**
- **Wide range of colors as well as black, white, and clear.**
- **Colors are furnished in high gloss finish.**
- **Clear may be had in high or medium gloss.**

Write for further details.

THE EGYPTIAN LACQUER MFG. COMPANY

ROCKEFELLER CENTER, NEW YORK

Please mention THE MONTHLY REVIEW *when writing*

NEWLY FORMED UDYLITE CORPORATION ACQUIRES BRIGHT NICKEL CORPORATION

All the capital stock of the Bright Nickel Corporation, Detroit, owners of the basic Schlotter patents covering bright nickel plating process, has been acquired by the newly-formed Udylite Corporation.

Preceding the acquisition of the capital stock of the Bright Nickel Corporation, the Udylite Company formed a new organization to be known as the Udylite Corporation which has taken over all of the business and assets of the Udylite Company. This company is widely known as one of the leading plating and polishing supply and equipment houses in the country.

The advantage of the Bright Nickel process results from materials coming from the tanks bright and shining, thereby eliminating buffing, with a consequent saving in time, labor and money.

The Bright Nickel Corporation will be operated as a wholly owned subsidiary of the Udylite Corporation.

The personnel and policies of the Udylite Corporation will remain the same as those of the Udylite Company, which it supersedes and the same management will continue. Officers of the new corporation are as follows: Charles Ackermann, chairman of the board; L. K. Lindahl, president; C. H. Reeme, vice president; and Horace Maynard, secretary.

The new Corporation, through the acquisition of the Bright Nickel Corporation, can now offer the metal finishing industries a more complete range of products and processes, increased technical facilities as well as an organization equipped to handle a more rounded-out variety of metal finishing problems.

CHICAGO BRANCH CORRECTION

A correction is to be made in the minutes of the December meeting published in the January REVIEW, page 47.

The answer to the only question asked should read:

A mild cleaner should be used and a 5% sulphuric acid dip before plating.

A. E. S. Buttons

A small supply of buttons to be worn on the coat lapel will be on hand at the Executive Secretary's office 90 Maynard Street, Springfield, Mass. after January 1st, 1939. The price of these buttons is 40 cents each. They are 9/16" in diameter. Colors, Blue outside. White in center.

CHICAGO BRANCH

The regular monthly meeting of the Chicago Branch was held Feb. 11, 1939, at the Atlantic Hotel. President J. W. Hanlon presiding, and all other officers present except the Librarian O. Weickmann.

Communications were read and ordered placed on file. Applications of C. F. Schiller, C. M. Iwin and W. M. Vande Bogart read and all were elected to membership. A motion was made and passed that the Educational Session proceedings be printed and sent to each member of Chicago Branch. A motion was made and passed that the reprints of the paper "Metal Coloring" from the proceedings of the American Chemical Society be printed and sent to each member of Chicago Branch. Mr. H. A. Gilbertson, chairman of the Banquet Committee read his report on the Banquet and it was accepted as read. President J. W. Hanlon discharged the Banquet Committee with a rising

DETREX DEGREASING

"TAILOR MADE" TO FIT YOUR METAL CLEANING REQUIREMENTS!

What's your cleaning problem? Does it call for "tailor made" results?

Investigate the advantages DETREX degreasing offers you. You will find, as have thousands of others, that this new improved cleaning method insures uniform, effective, and low-cost results.

The Machines, Methods, and Materials for DETREX Degreasing are vital parts of a "tailor made" process which meets the most exacting metal cleaning demands of today.

Don't wait while misfit methods jeopardize your profits. Request DETREX Free Advisory Service now. It's a "stitch in time" ... worth taking.

Without obligation, a DETREX Engineer will call and make complete recommendations fitted to your cleaning problem.

METAL CLEANING ENGINEERS · DETREX · DETROIT REX PRODUCTS

DETROIT REX PRODUCTS CO.

Metal Cleaning Engineers — Solvent Degreasing and Alkali Cleaning

13013 HILLVIEW AVENUE · DETROIT, MICHIGAN

Branch Offices in Principal Cities

vote of thanks. Mr. F. J. Hanlon read his report on the methods used in conducting educational matters to members, and it was accepted as read. Mr. R. Hazucha asked for bowlers to join the Chicago Branch League for a match with Milwaukee Branch. Mr. O. E. Servis asked for the "good old bowlers" to join him in a match with the "old timers" in Milwaukee Branch.

The meeting was then turned over to Mr. O. E. Servis acting Librarian in the absence of O. Weickmann, and found the following questions in the question box:

Q. Will ammonium chloride used in a cold nickel plating solution be harmful if the solution is worked hot? Can a lead lining be used?

A. Ammonium chloride will do no harm but it is suggested to discontinue its use in the hot bath. Lead lining can be used.

Q. What is the best procedure for gold plating zinc die castings?

A. Nickel plate and copper or brass plate and then gold plate.

Q. What do you suggest for a cleaning cycle for 10-15% *leaded brasses previous to nickel plating?*

A. Agitated whale oil soap solution soaked and cleaned in any of the regular cleaners for a short time.

Mr. Spencer of the Crown Rheostat & Supply Co. gave his third talk on "Basic Principles in Figuring Costs" which was very interesting and instructive.

NEWARK BRANCH

The regular meeting of the Newark Branch, A.E.S., was held on Friday evening, January 20, 1939, at the club room of the Hotel Douglas, Newark, N. J. The meeting was called to order at 8:30 p.m., with President John Kotches presiding. Other officers present were: George Wagner, secretary; Nelson Sievering, treasurer; Jack Shamis, vice-president; Paul Oldam, Librarian; Stephen Leshnick, sarg.-at-arms; William Harrison, Harmon Hunt and George Reuter, trustees.

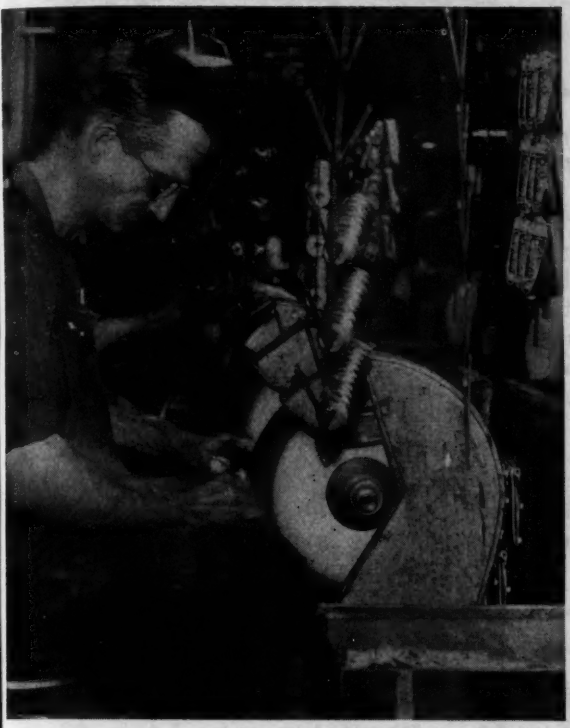
The minutes of the previous meeting were read and approved. Mr. Harmon S. Hunt announced that he was going to speak in Philadelphia on Friday, January 27, 1939, on "Further Developments on Wetting Agents". Mr. Wagner reported that the Banquet Committee for the Newark-New York Banquet held a committee meeting on January 18th, at the Hotel Pennsylvania in New York. He asked the members to make use of as many tickets as possible, as an attendance of 500 would be expected, of which number 250 should come from Newark Branch. He also asked the members to solicit their employers for some door prizes to be given away at the Banquet. At least 50 door prizes will be given away free of charge, some of which will have a value of $25.00. The menu has been selected, the orchestra is hired, the arrangements for the afternoon session are completed and the ladies' program for the afternoon is left with the ladies, in other words, a good time will be at hand for all.

Mr. Oliver J. Sizelove was next presented as our guest speaker for the evening. His subject was "Electric Cleaners". Mr. Sizelove explained to us why certain films are not removed by certain types of electric cleaners and why some cleaners form films on the work to be plated instead of removing films. His paper was very interesting and will be forwarded to the REVIEW for publication by Mr. Sizelove personally. He was given a rising vote of thanks by the 58 members who attended this meeting. Mr. Paul Oldam, our Librarian, conducted a question box which also proved interesting. Meeting adjourned at 10 p.m. and was followed with refreshments, "Newark Style". A half barrel of beer was donated by Mr. Sizelove who received a hearty round of applause for same.

GEORGE WAGNER, *Sec.*

PHILADELPHIA BRANCH

Dr. Walter Meyer will speak at the regular meeting of Philadelphia Branch on March 24th. His subject will be "Filtration of Plating Solutions". It is expected that there will be a large attendance to greet Dr. Meyer.



On the High Production Jobs . . .

ALUNDUM ABRASIVE

WHEN conveyor systems are feeding parts to the polishers, only a high production abrasive can be used — no tie-ups can be tolerated.

And it's on such jobs that Alundum Abrasive is popular. Special shaping operations in its manufacture assure a fast cutting grain. Special surface treatments give high capillarity — extra sticking power so the grain stays on the wheel until its full job is done. You can depend on Alundum Abrasive to keep pace on your high production jobs.

NORTON COMPANY, WORCESTER, MASS.

G-83

NORTON ABRASIVES

The Plated-Ware Exhibit

The Newark Branch Convention committee for the 1939 American Electroplaters' Society International Convention at Asbury Park, N. J., has resolved that the plater shall be known by the plating he does, and with a set determination to have every branch of the American Electroplaters' Society represented with electroplated articles on display at the Plated-Ware Exhibit during the convention. To make such a realization come true the committee has unanimously agreed to pay the express charges on the articles to be exhibited, to Asbury Park and back to the exhibitor's address, providing that the exhibitor is a member of the A.E.S.

Isn't that a worthy inducement for you to participate with at least some small article? Don't wait until the last minute to prepare a display. Start now, by laying aside an article of your manufacture, and plan to have your product mounted on a board for the sake of attraction.

Everyone knows that the plater does the plating. But, does everyone know what the plater plates? We as platers know of the difficulties which are encountered in plating various production articles. The intricate shapes and different types of alloys which are encountered in plating can only be guessed at even by ourselves. What the eyes see the mind will believe. How then can the plater show what he plates and how well he plates? This is his greatest opportunity. Show us by exhibiting a display of your plated articles. This is your chance to throw out your chest, to point with pride at the display of plated specimens which you yourself have plated or were plated under your supervision.

To date, Detroit, Rochester, Milwaukee, Bridgeport and New York have signified their intentions by appointing a chairman of their branch who will solicit plated articles that will be displayed at the Plated-Ware Exhibit. Has your branch appointed a chairman? So come along fellows and lets make the Plated-Ware Exhibit at the International Convention a successful success.

THE PLATED-WARE EXHIBIT COMMITTEE.
PAUL A. OLDAM, *Chairman*,
90 Montgomery Ave.,
Newark, New Jersey.

HEADQUARTERS FOR GOLD AND SILVER SALTS

Merck Gold and Silver Salts are manufactured carefully and by precision methods. The finished products must undergo a score of separately conducted tests. Even minor metallic impurities are removed entirely or reduced to insignificant limits.

Prices Will Be Mailed on Request

The Merck line includes:

GOLD

Bromide
CHLORIDE
CYANIDE
Tribromide
& Potassium Cyanide
& Sodium Chloride
& Sodium Cyanide

SILVER

Precipitated
Acetate
Bromide
Carbonate
CHLORIDE
CYANIDE
Iodide
NITRATE
OXIDE
Sulfate

MERCK & CO. INC. *Manufacturing Chemists* **RAHWAY, N. J.**

New York Philadelphia St. Louis

McALEER BUFFING COMPOSITIONS Are Made at "Buffing Headquarters!"

When you specify "buffing compositions by McAleer" you know that you are using the best product which the market affords for its specific use.

McAleer is not only a pioneer in the metal polishing field, but is also a leader in the development of advanced polishing technique and materials.

A big, new, modern plant providing manufacturing equipment of the most advanced design enables McAleer to furnish a product of even greater uniformity than ever before. There is a McAleer product for every buffing or polishing requirement.

McALEER MANUFACTURING COMPANY

Detroit, Michigan Walkerville, Ont.

Membership Campaign

February 1, 1939

Branch	Elected	Reinstated
Detroit	45	
St. Louis	26	
Chicago	24	
Philadelphia	21	2
Buffalo	20	
Grand Rapids	17	1
New Haven	17	
Newark	14	1
Toronto	10	1
Cleveland	9	
Los Angeles	7	
New York	6	2
San Francisco	6	
Dayton	5	1
Boston	5	
Hartford	3	
Toledo	3	
Springfield	2	1
Binghamton-Syracuse	2	
Milwaukee	2	
Rochester	2	
Waterbury	2	
Pittsburgh	1	1
Anderson	1	
Bridgeport	1	
Cincinnati	1	
Providence-Attleboro		1
Baltimore-Washington		
Montreal		

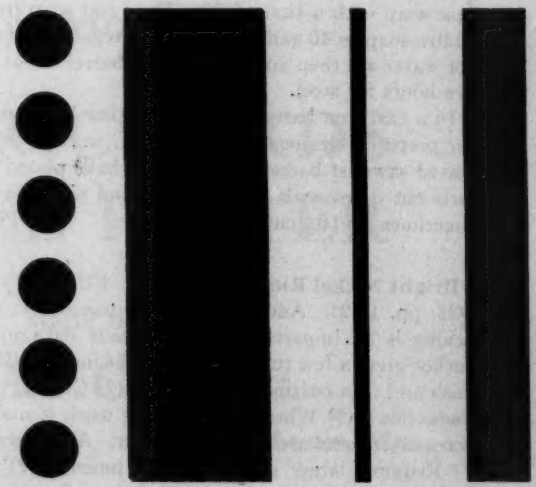
HARSHAW ANODES

More and more, skilful platers throughout the country are specifying Harshaw anodes... What better proof of superior performance is necessary?

THE HARSHAW CHEMICAL CO.

Manufacturers, Importers, Merchants
Offices and Laboratories: Cleveland, Ohio
Quality products since 1892

New York, Philadelphia, Chicago, Detroit, Pittsburgh
Cincinnati, East Liverpool, Los Angeles, San Francisco
Works at Cleveland and Elyria, Ohio and Philadelphia, Pa.



Please mention THE MONTHLY REVIEW *when writing*

The Abstract Section

FREDERICK FULFORTH, *Chairman, Program and Educational Committee*

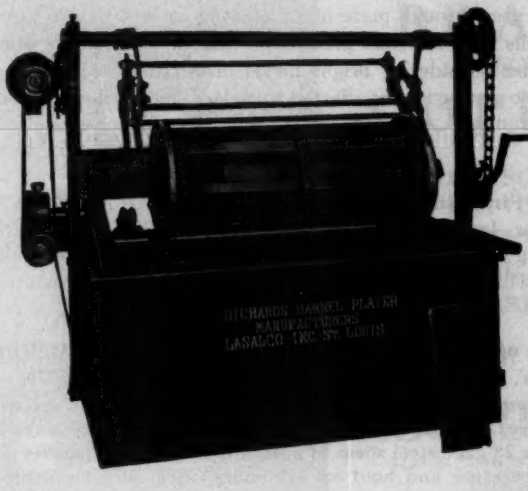
Barrel Finishing of Metal Products. By H. LEROY BEAVER. *Product Finishing*, Nov. 1938, pp. 24-31. Discusses the great importance of cleaning in barrel finishing, as author's correspondence on trouble jobs indicated this as major source of difficulties. Some trouble exists due to inclusions and dirt in low grade steels. Slushing oils and drawing compounds exaggerate this effect by finding their way into pores, making removal difficult. Sawdust tumbling does not help. Author recommends careful cleaning before barrel operations are begun. Penetration of cleaners into pores helped by addition of wetting agents, as sulphonated alcohols. Wetting agents alone not recommended for burnishing, except with about 2% regular burnishing soaps. Cleaning prior to barrel burnishing should be done in a separate tank or barrel with hot cleaner. PHIL J. RITZENTHALER.

Barrel Finishing of Metal Products. By H. LEROY BEAVER. *Product Finishing*, Dec. 1938, pp. 26-30. Discusses English barrel finishing practice. Long and narrow type and high and narrow type not used, but oblique type with ten sides. Smaller barrels are 24" deep with 18" mouth. Larger type have 30" depth and 24" mouth. Now use, in addition to ¼" steel balls, 1/16" x ½" taper steel pins, as well as stars, ovals and kidney shaped pieces. They use about 5-6 times as much water as is American practice, and a vegetable oil base soap with a titer of 29. They add soap from a stock solution made of 10 lbs. soap to 40 gallons water. Two gallons of this solution and 2 gallons of hot water are then added. Time in barrel about 2 hours on brass and two to five hours for steel.

In a cast iron barrel, the fluid used is 10% caustic soda, as compared with our prepared cleaners. After plating, work is thoroughly rinsed and dried in heated sawdust barrels. Burnishing balls plated along with work. Cast iron parts cut down with foundry sand and oil in barrel for 2-3 days. Pumice is sometimes used for cutting down. PHIL J. RITZENTHALER.

Bright Nickel Ricochets. By F. FULFORTH. *Product Finishing*, Dec. 1938, pp. 17-21. Author discusses some bright nickel problems. One thing lacking is an impartial bureau to issue data on various patented solutions. Author gives a few reasons why bright nickel will stay in: (1) Low cost bright finish and thin coatings not buffed. (2) Cutting of plating time with boost in production. (3) Where some buffing used, it makes this easier as knowledge increases, rejects are becoming lower. Arguments against bright nickel are: (1) Requires larger generating equipment. (2) Added cost of temperature control and quinhydrone set. (3) Better cleaning needed. (4) Usually higher rejects and stripping trouble. (5) A technical serviceman to keep bath going.

Made in Four Sizes



Write for Bulletin No. 20

The best equipment is the cheapest in the long run.

PROVE THIS TO YOURSELF

INVESTIGATE

THE RICHARDS BARREL PLATER

Made by

LASALCO Inc.

2822 - 38 Lasalle Street St. Louis, Mo.

(6) Need for cyanide copper flash. Author bemoans lack of information to guide small user through maze of advertising to help in selection of bath for his use. Tells need for close production control to eliminate rejects from all causes. When considering bright nickel installation, this is a good time to revamp whole plating layout affected to make a smooth flow of production with minimum handling. Adequate racks should also be considered.

PHIL J. RITZENTHALER.

Abrasive Finishing of Stainless Steel. By BARTLETT WEST. *Products Finishing*, January, 1939. A short but informative article on the grinding and polishing of stainless steel. The procedure best adapted to desired finish is described with details of types and speeds of wheels, abrasives, etc. H. LACY.

Diffusion of Zinc and Iron at Temperatures Above Melting Point of Zinc. By W. G. IMHOFF. *Products Finishing*, January, 1939. This article embodies a research investigation into the properties of zinc and iron at temperatures above the melting point of zinc. For this investigation the method was to immerse a 28 gage steel sheet in a bath of commercial quality zinc, heat to desired temperature and hold for six hours, then allow crucible containing zinc and test sheet to cool slowly overnight in the furnace. When cold, the melts at different temperatures were removed from the crucibles, sawed in half, polished and etched for study under the microscope. Temperatures varied from 800° F. to 1565° F. At the highest temperatures the iron merely dissolves in the zinc. The temperature at which diffusion is most rapid is 950° F. The mechanism of the diffusion process is described in some detail.

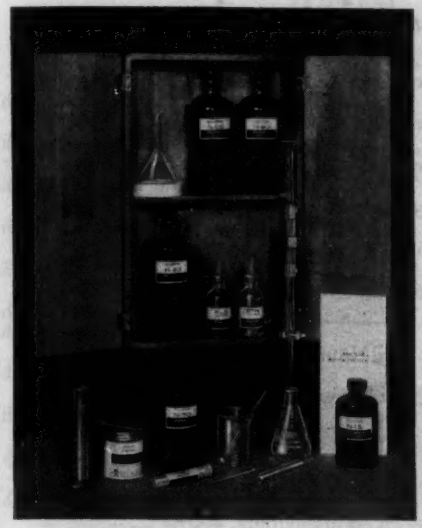
E. LACY.

Metal Finishing Highlights of 1938. By F. W. VOGEL. *Products Finishing*, January, 1939. This is a resumé of developments in the field of metal finishing during 1938. Brief descriptions of new cleaning methods, high speed plating, electrolytic color plating, bonderizing, etc., are given. Also described are new tests for finishes, pH. papers information on new stop-off lacquers, lining for pickle tanks, abrasives, polishing and tumbling machines and other equipment. Altogether, this is an excellent guide to what is new in metal finishing for 1939. E. LACY.

Methods Used In Silverware Manufacture. By FRED VOGEL. "*Product Finishing*", Jan. 1939, pp. 7-15. Describes production in International Silver Company. Good discussion on automatic polishing equipment needed on silver flatware. Silver strike, high in copper used preliminary to silver plating. Agitation (mechanical) is used at cathode; anodes are shielded with cotton baffle filter screens. Accurate check is made of weight of silver plated, to control thickness of plating. Full automatic silver plating machine is used. Unique process is application of heavier coating on bottom of bowl of spoon. Pieces suspended over tank, with tubes squirting solution on bottom of spoon only. Thus only area in contact with solutions will plate.

PHIL J. RITZENTHALER.

NEW! NEW!



BRASS
AND
COPPER

CYANIDE SOLUTIONS
ARE RAPIDLY AND
ACCURATELY TESTED
FOR METAL, CYANIDE
AND CARBONATE

Write for full information

KOCOUR CO.
4725 S. CHRISTIANA AVE.
CHICAGO

. . . ALL KINDS OF TESTING INSTRUMENTS . .

Announcing...

THE ANODEX PROCESS

THE NEW METHOD OF METAL PREPARATION

A fast — practical — positive and complete method for cleaning steel and ferrous alloys prior to electroplating on racked work.

TECHNICAL BULLETIN AVAILABLE

MacDermid Incorporated
WATERBURY CONNECTICUT

Membership Report

to January 1, 1939

ELECTIONS

Jack A. Morse, c/o Allen Calculators, 678 Front Street, N.W., Grand Rapids, Mich. Associate, Grand Rapids Branch

Clyde Craven, 127 Wellenwood Ave., N. E., Grand Rapids, Michigan Associate, Grand Rapids Branch

William Holwerda, 1900 Palace Ave., S.W., Grand Rapids, Michigan Active, Grand Rapids Branch

Heamon Castle, 1405 Johnston Ave., S.E., Grand Rapids, Michigan Active, Grand Rapids Branch

Alfred Jeanneret, 59-11 Queens Blvd., Woodside, L.I., N.Y. Active, New York Branch

Matthew McCleave, 151 Eckford Street, Brooklyn, New York Active, New York Branch

Frank M. Tutolo Active, Waterbury Branch

Patrick McGuire, 35 Macaulay St., E., Hamilton, Ont. Associate, Toronto Branch

Joseph F. Hart, 909 East 60th St., Los Angeles, Cal. Associate, Los Angeles Branch

Armand W. Faucher, 118 Levesque Ave., West Hartford, Conn. Active, New Haven Branch

Edgar W. Luther, 121 Washington St., Hartford, Conn. Active, New Haven Branch

Richard D. Catanzaro, 1723 S. 10th St., Philadelphia, Pa. Active, Philadelphia Branch

August B. Hoefer, 43-53 193rd St., Flushing, N. Y. Associate, Philadelphia Branch

Salvatore Catanzaro, 1723 S. 10th St., Philadelphia, Pa. Active, Philadelphia Branch

William H. Nuhohon, 800 Spring Bank West, Hull, Yorks, England Active, Philadelphia Branch

Raymond E. Hinchcliffe, Metallurgical Dept., Fafnir Bearing Co., New Britain, Conn. Associate, Hartford Branch

G. S. Bergendahl, 438 E. Phil Ellena St., Philadelphia, Pa. Associate, Philadelphia Branch

Arthur G. Snow, 218 East Athens Ave., Ardmore, Penna. Associate, Philadelphia Branch

George Racine, 521 Reaney St., Chester, Pa. Active, Philadelphia Branch

Joseph H. Miraski, 4720 Penn St., Philadelphia, Pa. Associate, Philadelphia Branch

J. C. Mylin, Strasburg Co., Lancaster Penna. Associate, Philadelphia Branch

Arndt, Ezra P., 3024 Harding Ave., Detroit, Mich. Active, Detroit Branch

Howard J. Hogan, Harshaw Chem. Co., 1627 W. Fort St., Detroit Associate, Detroit Branch

Robert Hurley, 9630 Mark Twain St., Detroit, Mich. Associate, Detroit Branch

Stanley Still Krentel, 701 Grove St., E. Lansing, Mich. Associate, Detroit Branch

D. Clark Matthews, Eaton Clark Co., 1490 Franklin, Detroit, Mich. Associate, Detroit Branch

Harvey Kelley, Aluminum Co. of America, Edgewater, N. J. Active, New York Branch

C. F. Schiller, Genoa, Ill. Chicago Branch

C. M. Iwin, 620 Aldine Ave., Chicago, Ill. Chicago Branch

W. M. Vande Bogart, 4724 S. Cristiana Ave., Chicago, Ill. Chicago Branch

Harry G. Diller, 4827a Cote Brilliante Ave., St. Louis, Mo. St. Louis Branch

Milton Mestermacher, 3514 Colonial Ave., Normandy, Mo. St. Louis Branch

ELECTIONS (*Continued*)